THE AEROPLANE and ASTRONAUTICS

FEBRUARY 24, 1961

EVERY FRIDAY
ONE SHILLING
AND SIXPENCE

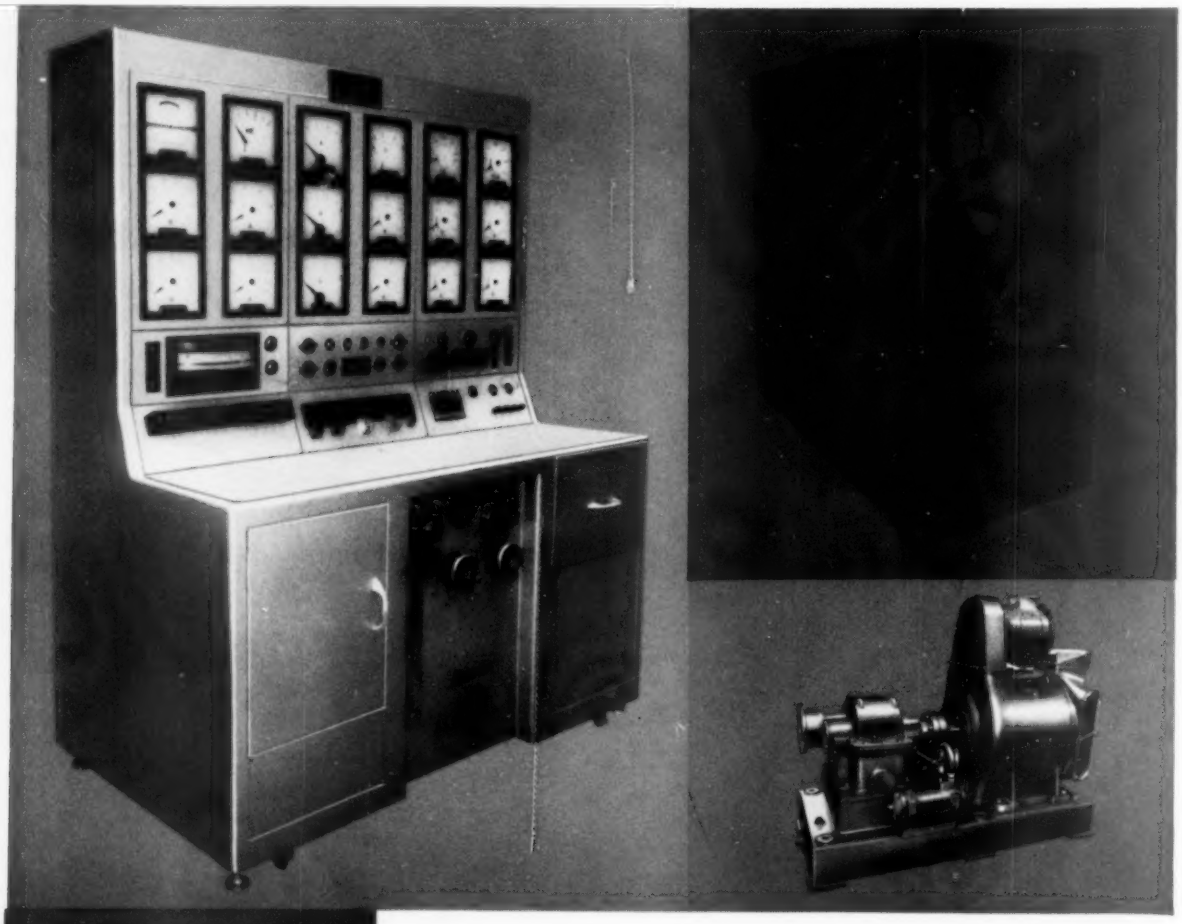
TODAY'S
ECONOMIC
AIR FREIGHTER

ARGOSY

HAWKER SIDDELEY AVIATION 32 Duke Street, London, S.W.1

ROTAX COMPLETE GENERATING TEST EQUIPMENT

Designed specifically for the overhaul of aircraft generating equipment, giving precision results over a wide speed range. Built for testing the generating systems of ELECTRA, VISCOUNT, BRITANNIA, FRIENDSHIP, ARGOSY, CARAVELLE AND VANGUARD AIRCRAFT.



ROTAX

INDUSTRIAL GROUP

ROTAX LIMITED, WILLESDEN JUNCTION, LONDON, N.W.10. Tel: ELGar 7777

Second class postage paid at New York, N.Y.

BEA VANGUARD

BUILT BY VICKERS POWERED BY ROLLS-ROYCE

Newest in air travel

March 1961 is an important month for people who fly. For that is when BEA introduces the brand-new Vanguard jet-prop airliner on their Paris service.

Built by Vickers, the Vanguard has been specifically designed to meet the tremendous increase in European air travel. It is one of the largest airliners in the world, seating over 100 passengers in four spacious cabins.

Four Rolls-Royce Tyne jet-prop engines power the Vanguard. Extra-large freight holds and quick turn-round facilities ensure that it pays its way, all the way.

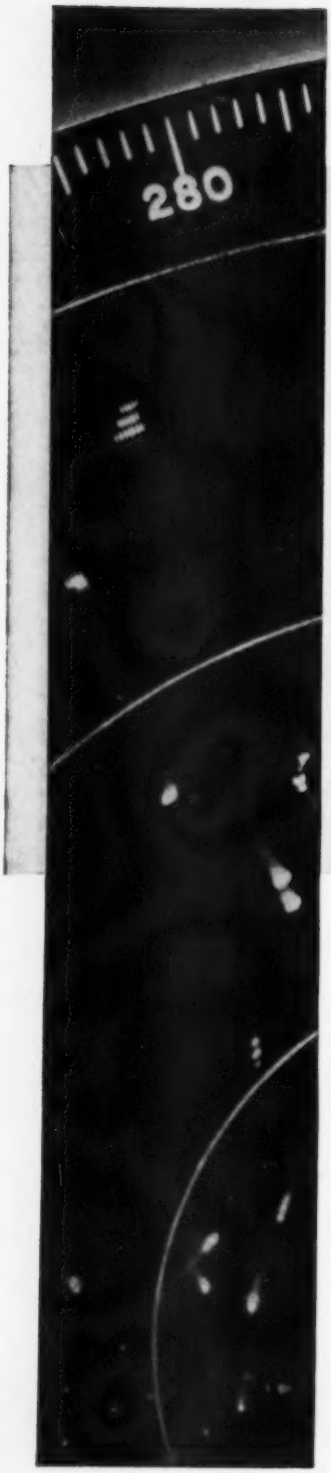
By introducing the Vanguard, BEA will be able to offer you more services with more seats available on them.

fly BEA

A

DASR-1

THE OUTSTANDING RADAR FOR THE JET AGE



DASR-1 incorporates these outstanding 10 cm. features:—

- Absolutely constant and gap-free coverage through 360°.
- High discrimination at all ranges out to the maximum.
- A high data rate continuously maintained.
- Reduction of siting limitations due to ground reflections.
- A highly effective, fail-safe permanent echo suppression system without blind speeds.
- Sustained high performance in bad weather conditions provided by the most advanced circular polarisation system yet developed.
- A large measure of built-in 'stand-by' facility.

Surveillance Radar with solid gap-free coverage

DECCA RADAR DECCA RADAR LIMITED · LONDON · ENGLAND

DR157

THERE GOES AEI

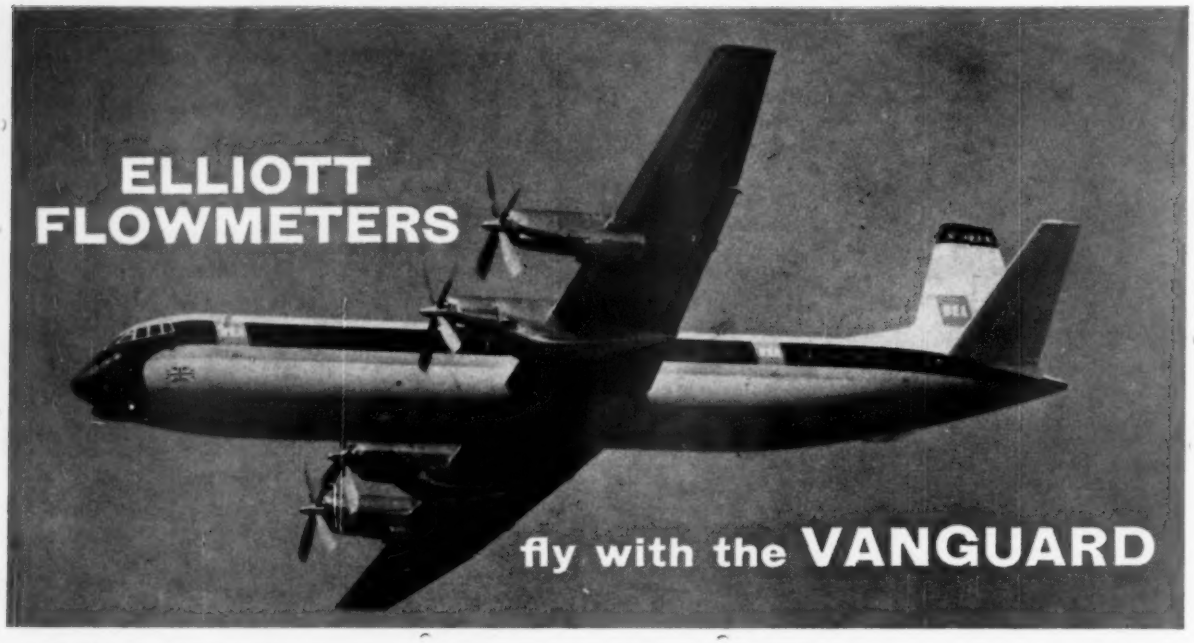
Like every Vickers-built aircraft,
the VANGUARD flies with AEI electrical equipment . . .
Electric motors and associated switchgear to meet the demand for
power to operate hydraulic systems, and for radio, radar and
a host of servo applications.

AEI says 'Success to the VANGUARD'

AEI

Associated Electrical Industries Ltd
Aircraft Equipment Group
COVENTRY ENGLAND

A5643



Elliott mass Flowmeters ensure accurate measurement of fuel flow

ELLIOTT

AIRCRAFT ENGINE INSTRUMENTS DIVISION
ELLIOTT BROTHERS (LONDON) LTD.
AIRPORT WORKS · ROCHESTER · KENT · (Chatham 44400)
ELSTREE WAY · BOREHAMWOOD · HERTS · (Elstree 2040)
A member of the Elliott Automation Group

Specialists in air movement

PLANNAIR

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED

are among those who

PLAN WITH PLANNAIR

whenever it is necessary to control air temperature

—and PLANNAIR take pride in announcing that the Vanguard has been equipped with PLANNAIR blowers for the following purposes:

Cabin air recirculation • Animal bay ventilation
Louvre boost • Radio rack cooling
T.R.U. cooling • Smoke detection suction unit

PLANNAIR LIMITED Windfield House · Leatherhead · Surrey
Telephone: Leatherhead 4091/3, 2231

PLA60

Canopied by stars....

. . . . . *in safety, the modern traveller of the air, voyages in comfort through the effortless miles of space, assured in the knowledge that all the ingenuity and skill comprising the many facets of the aircraft industry have been moulded together so that "luxury travelling" is now the commonplace of the air.*

The Walter Kidde Company Limited, never content with the present, always looking to the future, will maintain the position that has made them the leading specialists in aircraft safety equipment.

THE WALTER KIDDE COMPANY LIMITED

BELVUE ROAD · NORTHOLT · MIDDLESEX *Telephone VIKING 6611*

Introducing

CREW EMERGENCY OXYGEN SYSTEM FOR VANGUARD (A.R.B. Approved) For Unrestricted Use Up To 34,000 ft. Oxygen Immediately Available at the Turn of a Knob.

A flush mounting mask stowage and control valve unit is supplied and fitted adjacent to each crew member's position. By turning the control knob to "ON" the door of the container opens, the mask is ejected and both oxygen and the mask microphone are automatically turned on. The mask is provided with a combined microphone-oxygen lead, and can be donned ready for use within 3 seconds. The units are connected to a ring main which is supplied with oxygen at 1,800 p.s.i. from a 750 litre storage cylinder. Cylinders can be charged quickly without the use of spanners.

Also designers and manufacturers of Passenger Oxygen Equipment for the Britannia, Comet IV, Caravelle and now the V.C.10.

★ Glacier DU & DQ Bushes are fitted in the engine and flying controls.

★ Glacier DU & DQ Bushes are used in numerous applications in the air conditioning plant.

★ Glacier DU Bushes are fitted in the four Rolls-Royce "Tyne" engines which power the aircraft.

Glacier DU dry bearings are composed of thin steel strip with a porous bronze coating impregnated with a mixture of a fluoro-carbon plastic (P.T.F.E.) and lead.

Glacier DQ is an easily machinable dry bearing material, consisting of a Fluoro-carbon (P.T.F.E.) strengthened with special fillers. Supplied from stock and in a range of standard bars and tubes.

GLACIER

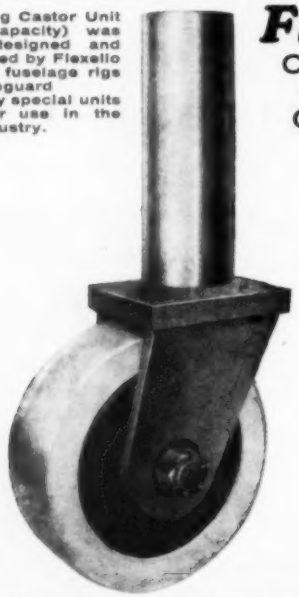
THE GLACIER METAL COMPANY LTD · ALPERTON · WEMBLEY · MIDDLESEX

Congratulations

Flexello congratulate Vickers Armstrongs (Aircraft) Ltd. on the inauguration of the Vanguard on BEA London to Paris routes and are proud of their association with this triumphant achievement.

This Jacking Castor Unit (10 ton capacity) was specially designed and manufactured by Flexello for use on fuselage rigs for the Vanguard one of many special units created for use in the aircraft industry.

Flexello CONSTANT QUALITY CASTORS

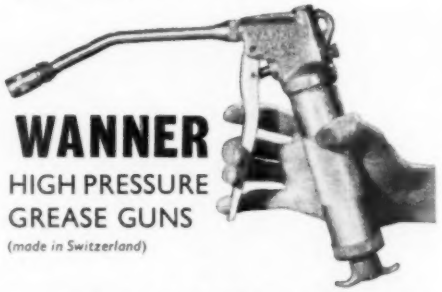


Flexello Castors & Wheels Ltd., Slough, Bucks Slough 24121

BEA select the best in lubrication equipment for their new

Vickers Vanguards

★ *Leading car makers also use it. You need the best for your car too.*

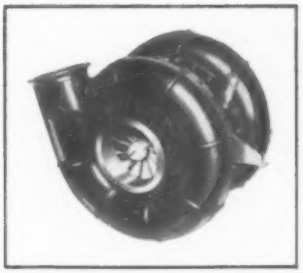


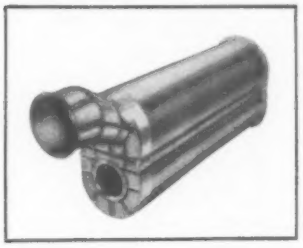
WANNER HIGH PRESSURE GREASE GUNS

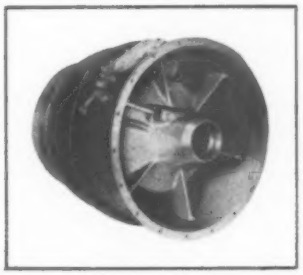
(made in Switzerland)

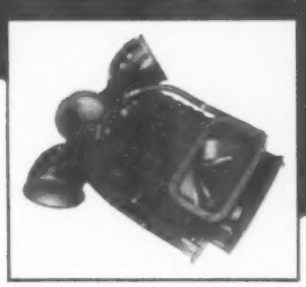
Obtainable from all branches of Halfords, Gamages and other stockists. Wholesale stockists: Brown Brothers Ltd., Buck & Hickman Ltd. and other leading factors. Trade enquiries invited. Send for catalogue of high pressure grease guns and connectors from:—

STEP INDUSTRIAL EQUIPMENT LIMITED
Berkhamsted, Herts. Tel.: 62



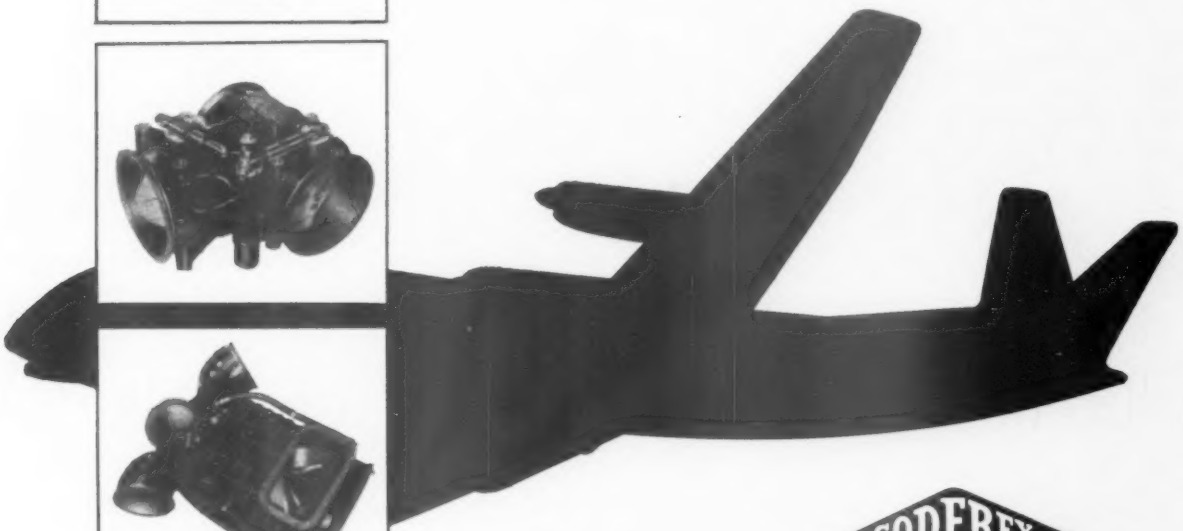






Godfrey equipment in the VANGUARD

SIR GEORGE GODFREY & PARTNERS LTD. are pleased to announce that they have designed and manufactured major components in the Vickers Vanguard air conditioning system. These components include cabin compressors, cold air units, water extractors, feed back valves, turbine driven fans and shut off valves.



GODFREY

SIR GEORGE GODFREY & PARTNERS LIMITED

HANWORTH, MIDDLESEX AND HENLEY, OXFORDSHIRE

TELEPHONE: FELTHAM 3291 CABLES: GODFREPART, LONDON

ASSOCIATED COMPANIES IN: MONTREAL, MELBOURNE AND JOHANNESBURG

H.P. 8314

DART

Herald

Pressurised civil or military jet-prop transport; 56 passengers or over 6½ tons of freight or combination of both at 275 m.p.h. for 850 miles; operates from 1000-yard grass airstrips; built for long life and easy maintenance; 1d a passenger-mile economy.

...flew a Herald on flood relief

A Dart Herald was in Brazil recently—during one of its tough see-it-in-action proving flights which have taken aircraft of this type nearly 200,000 miles around the world to 56 widely-differing countries—word came of devastating floods 800 miles away to the north-west. Its crew's prompt offer to help with flood-relief transport was immediately accepted.

On one flight alone this Herald carried nearly 7 tons of clothing and other urgent supplies, spares and fuel from Recife to Fortaleza in the stricken area. Such a mission of mercy is indicative of its adaptability to local conditions and of its capabilities as airliner or freighter and as civil or military transport.

Heralds are built by Handley Page to fly; to fly strongly and safely with power to spare. They are making light work of some of the most difficult flying conditions and airstrips to be found anywhere.

Their fail-safe design, craftsmanship and Rolls-Royce Dart engines are guarantees of economy, versatility and safety.

Now at Handley Page's factories around London, production is apace on the first batch of 25 Heralds for service with Jersey Airlines, British European Airways and other operators.

HANDLEY PAGE RADLETT LONDON READING

THE AEROPLANE and ASTRONAUTICS

VOLUME 100 NUMBER 2575 FEBRUARY 24, 1961

More Sales in Sight

A trip to the Middle East last week provided convincing evidence of the possibilities for further sales of British aircraft in that whole vast area, including that covered by the United Arab Republic, Iraq and Turkey. Things are not always exactly what they seem, particularly in these days when effervescing nationalism demands uncompromising attacks on former wielders of temporal power. It was therefore a particularly eye-opening experience to have an opportunity as guest of Middle East Airlines to visit Beirut and to be received by the President of the Lebanon, H.E. General Fouad Chehab, and later to have a chance of discussing current affairs with the Prime Minister, H.E. Saeb Bey Salaam.

As a result of such personal encounters no doubt could remain in one's mind about the genuine wish of the leaders of the Lebanese people to welcome visitors to their lovely country from our own. It can be testified that everything a tourist could desire is to be found in Beirut and in the wonderful countryside. Just now one can ski on the mountains and swim in the warm Mediterranean. Every kind of fruit, from banana to apple, grows almost within sight of each other. First-class hotels exist in some quantity already, and their number is being increased.

To expand the tourist business air transport is essential. It is therefore particularly pertinent that Middle East Airlines, a B.O.A.C. associate company, plays such a vital part in the air network. It has built up its reputation with Viscounts and has now taken delivery of the second of its four Comet 4Cs. An option for a fifth is being "nursed." United Arab Airlines, whose lively activities in the Middle East are growing, already has three Comet 4Cs in service. Two more are on order. Sales of others can be expected with confidence.

Beirut must be regarded as a junction point of importance in the growing traffic that is to be expected between the cities of Europe, Asia Minor and Africa, and indeed those of Asia itself. The emerging and exuberant new countries will encourage the movement of business men and officials. And in this network the vital part to be played by Middle East Airlines can be clearly seen.

Towards the Air Bus

British European Airways' introduction, in a few weeks' time, of 114-seat Vickers Vanguards on the London-Glasgow and London-Edinburgh services is a dramatic reminder of the growth in domestic traffic which has occurred in the past year or so. With the help of the Vanguard, capacity offered by B.E.A. on domestic services will be 40% higher this summer than ever before.

If domestic traffic continues to grow as it has in the past year or two, the time may soon come when B.E.A. can take the next logical step by simplifying or abandoning booking procedures. This would call for high-frequency service at regular intervals—of the type, for instance, which has been proving so successful on Northeast Airlines' Boston-New York route, where an "on-the-hour, every-hour" Viscount departure has increased this airline's share of the total traffic from 10% to 38% in two years. The Vanguard, with its sound engineering, low seat-mile costs, low break-even load factors, large passenger and freight capacity and excellent handling characteristics, will prove ideal for this type of operation.

A special feature in this issue marks the formal entry of the Vanguard into B.E.A. service on Mar. 1.

Editor - - - - THURSTAN JAMES
Deputy Editor - - - - F. T. MEACOCK
Founder Editor (1911-1939) *C. G. Grey*

Proprietors: TEMPLE PRESS LIMITED
Chairman and Managing Director:
ROLAND E. DANGERFIELD

Editorial, Advertisement and Publishing Offices:
BOWLING GREEN LANE, LONDON, E.C.1

Telephone: TERminus 3636
Telegrams: "Pressimus London Telex"
Telex: 23839

Annual Subscription Rate: United Kingdom £4 15 0
Overseas £5. Canada and U.S.A. $15.00

© Temple Press Limited, 1961. The Proprietors will consider any written requests to reproduce articles and illustrations appearing in this journal. Comment and brief extracts which acknowledge *The Aeroplane and Astronautics* are permissible.

Matters of Moment

Franco-British First Flight

A DASSAULT Mirage III interceptor powered by a Rolls-Royce Avon RB.146 turbojet made its first flight at Melun-Villaroche on Feb. 13. Three further flights were completed on that day and the next one, and the aircraft was flown faster than Mach 2 at altitude.

The RB.146 Avon which powers the Mirage III gives a sea-level dry thrust of 12,500 lb.; this is increased to 16,000 lb. with the present afterburner. A further re-heat development giving significantly high performance at altitude is also being evaluated.

The Mirage III was recently selected to equip the Royal Australian Air Force; and an R.A.A.F. evaluation team now in France will shortly assess the handling and performance of the Avon-powered version. The Mirage III has also been ordered for production under licence in Switzerland, but it has been stated that these aircraft will be powered by the French Atar. Both the Avon- and Atar-engined versions of the Mirage III were fully described in our issue of Dec. 2, 1960.

Discoverers Aloft

WITHIN 24 hours last week-end, two more Discoverer satellites (XX and XXI) were sent into polar orbit by the U.S.A.F. from Vandenberg Air Force Base, California. The first, launched on Feb. 17, was expected to eject a re-entry capsule after four days. Part of its payload was IR missile-detection equipment under test for the Midas programme.

The second satellite, Discoverer XXI, put up on Feb. 18, carried no capsule, but was intended as a test of the restartable rocket engine of the Agena B top stage in orbit. This is being developed as a means of modifying a satellite's orbit after injection, for obtaining greater orbital precision, or for restoration of a decaying orbit.

Reconnaissance satellites—such as Samos—which are designed to function in close orbit for photographic surveillance purposes, are particularly vulnerable to drag effects. The restartable Agena B—used in the later-model Discoverers, and scheduled for Midas and Samos—should increase the orbital lifetime by a useful margin.

Apart from the problem of orbital decay, the present experimental Midas and Samos satellites have restricted utility, because gas supply for the orientation jet-controls is limited to about 20 days. These gas-jets have the function of keeping the satellite stage nose-down to the Earth's surface during the operation of sensing equipment and cameras. It is understood that the inertia wheel concept of attitude stabilization is now being considered for supplementing the reaction jet system for long duration control.

Another possible application for the restartable engine in military satellites, according to the U.S.A.F., might be for modifying the established orbit in the face of attack by an anti-satellite missile. It would also be vital for interceptor-satellites which enter coincident orbits to inspect or destroy other satellites.

Orbit of Discoverer XXI has a 670-mile apogee, 155-mile perigee and a period of just over 90 minutes. The engine of the satellite was successfully restarted by a radio command signal transmitted from Vandenberg A.F.B. on Feb. 19.

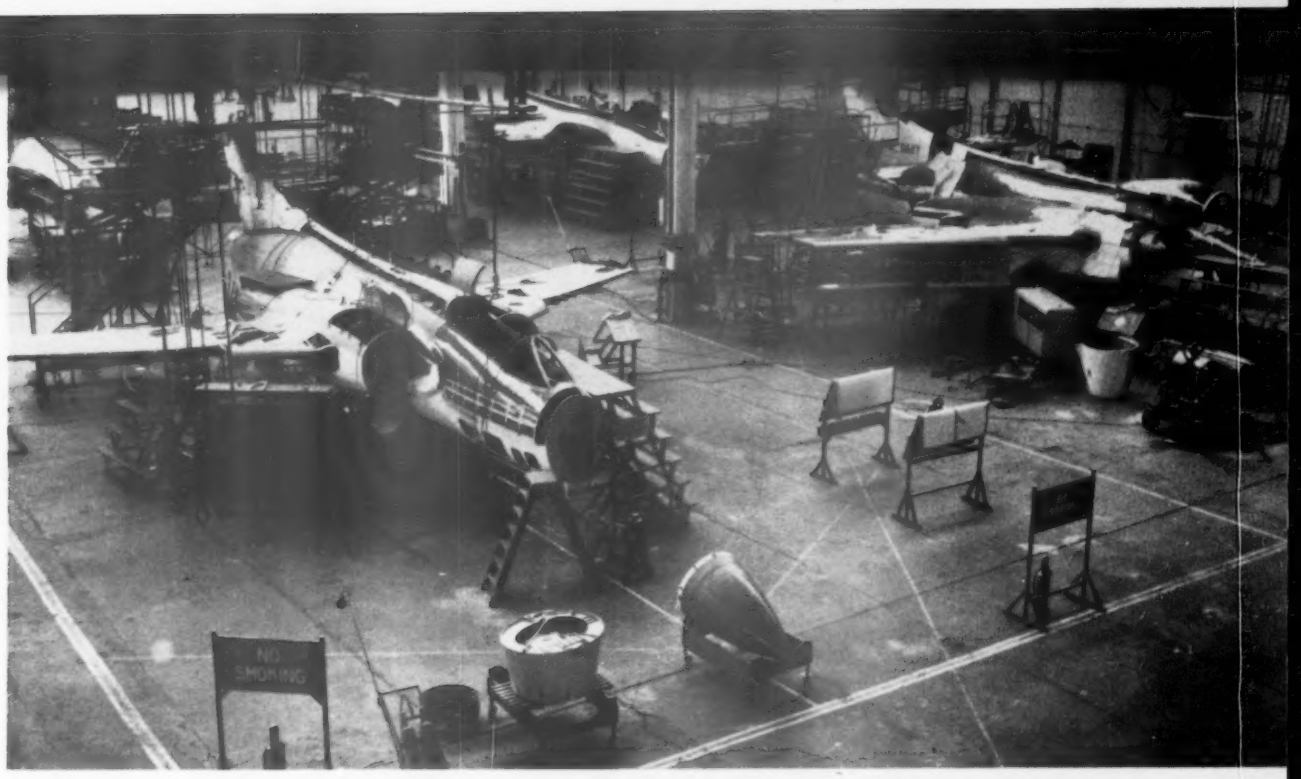
IN THE MIDDLE OF THINGS.—Sheikh Najib Alamuddin, chairman and managing director of Middle East Airlines at the Press conference to a party of British journalists in Beirut last week. He spoke strongly against B.E.A. competition in the Middle East with B.O.A.C. associate companies.

The Air Estimates

AS is customary, the Service estimates have now been published as a logical follow-up of the Defence White Paper. The total Air Estimate for 1961-62 (published as we went to press with this issue) is for £526,670,000—which compares with £535,460,010 last year, before taking into account the receipt of £2 million from the Federal German Government. The strength of the R.A.F. on Apr. 1 this year including women and boys, but excluding local forces abroad and civilians, will be 158,700 (4,750 fewer than at the same time last year). A reduction in manpower to 149,900 is expected by April, 1962, and the target strength for the all-regular force, which will be reached by 1963, is 135,000 adult males.

A discussion on the provisions of the Air Estimates in relation to equipment and organization will be included in our next issue.

BEIRUT INAUGURAL.—Twenty-five British journalists accompanied by their wives were the guests of Middle East Airlines last week. Most of them can be seen here in front of M.E.A.'s second Comet at the beginning of the trip on Feb. 16. They were received by the President of the Lebanon, H.E. General Fouad Chehab.



BUCCANEERS IN PRODUCTION.—This first photograph to be released showing Buccaneer production effort at Blackburn's Brough factory is of part of the final assembly section. The Buccaneer is being built in quantity for the Royal Navy as a low-level strike aircraft powered by two de Havilland Gyron Junior turbojets.

Venus Probe Accuracy

RUSSIA'S 1,420-lb. automatic interplanetary laboratory will miss the planet Venus by not more than 112,000 miles "without trajectorial corrections," according to *Tass* on Feb. 18. This statement was taken by some newspapers last week-end as indicating that the probe was off course, but in fact it represents very precise shooting indeed over the enormous distance involved.

For the probe actually to hit the planet or enter a close orbit around it, at least one mid-course correction would be necessary to compensate for the fact that the orbits of the Earth and Venus do not lie exactly in the same plane. It is still not clear whether the Russian probe has this capability.

The forecast was made on the basis of positional data obtained when the probe's transmitter was switched on by radio command on Feb. 17; it was then 1,180,000 miles from Earth. The transmitter is being commanded at intervals of five days to conserve the power supply, and presumably allow time for the solar cells to recharge chemical batteries.

Helicopters: A Decision Awaited

IN the House of Commons on Feb. 14 the Parliamentary Secretary to the Ministry of Aviation, MR. GEOFFREY RIPPON, repudiated a suggestion by MR. G. R. CHETWYND (Lab., Stockton-on-Tees) that we are falling behind in the race for a large-scale transport helicopter through failure to decide on the appropriate type for concentration and final development.

While that is as may be, perusal of the lately published annual report of the chairman of Westland Aircraft, Ltd. (in whom, of course, British helicopter interests now largely vest), taken in conjunction with B.E.A.'s understandable reluctance to proceed in the absence of declared Government policy, leaves one in no doubt that we are certainly not forging ahead in the race. Indeed one is forced to infer that, if we have not actually given up the race, we are having a breather somewhere down the course. So the parliamentary statement gives us in effect to understand that the rest of the field is likewise in a state of suspended animation. If this logical *sequitur* fails to lull us, then we must conclude *pace* ministerial awareness and probity, that the premise is a false one.

Before adopting that truly Gallic expedient of blaming the Government, it is worth taking a quick look for any ascertainable cause of the present impasse. In the first place, has a convincing case been made out for the type of aircraft in issue? The advantages of the helicopter for inter-city and metropolis-airport use have already been so canvassed and applauded that it is believed a referendum of informed public opinion in this country would answer the question in a resounding affirmative, and would add a rider that the whirling-stock should be British. Secondly, have we designs sufficiently advanced and promising to merit development? The *cognoscenti* say yes—at least two.

If these answers are correct—and it is submitted they are—it is now for the Government, acting in the name of the people who elected it and for whom it acts, to indicate its preferred design and to afford such encouragement, assistance and facilities as may result in unprotracted fulfilment of a project thought so well worth while by so many people. The decision is instant—the breathing space is up.

Whichever design is chosen, development and launching into Corporation service are going to cost the country a sizable sum of money, but there is every prospect that, with intelligent and diligent prosecution, the project will pay off in the end in fare-revenue and, it is hoped, oversea sales.

One aspect of development gives cause for some disquiet—in more senses than one—the bogy of NOISE. As regards at any rate its metropolis-airport rôle, the helicopter's adoption or otherwise will depend ultimately on the approbation of the people *outside* it and not of those within it. Of the two salient potential causes of disapproval, safety should present no problem; but if the aircraft in landing and taking off consistently creates an unacceptable noise, in volume or pitch, the ironical result could be that the public, whose purse and goodwill have sponsored the infliction, would throw it out and refuse to put up with it. How? Just by mass besieging of the tribunals for reduction in rates on the score of eclipsed amenities—which would force any Government either to give way or to resign.

It is known that much research has already been done on this problem, but the impression is current that it has not yet been solved. Let us therefore issue a directive in classic style: "amenitize and add more quietness."—O.W.H.C.

Twenty-five Years of Flying

IN welcoming the guests, especially the Secretary of State for Air and the Chief of the Air Staff, to last Friday's annual dinner of the University of London Air Squadron, the commanding officer, WG. CDR. V. REES, reminded his audience that the unit was now in its 25th year. During this period, 28 former members of the country's 17 university air squadrons have reached air rank, including two as commanders-in-chief.

Remarking on the recent statements in the popular Press regarding their possible disbandment, Wg. Cdr. Rees said that the squadrons should be expanded and not reduced. With the ending of National Service, the squadrons need to develop their increasing potential to interest members of the universities in the Service.

The Secretary of State for Air, the RT. HON. JULIAN AMERY, proposed the toast to the Squadron. As a former member of the Oxford squadron, Mr. Amery said he was particularly interested in the future of the units. He also remarked that the Air Staff took a very favourable view of their work.

But, he continued, in these times the squadrons must produce concrete results, in the form of aircrew, in addition to their less tangible work of making the country air-minded. The Service was having difficulty in getting aircrew of the right standard—an important factor when it costs approximately £150,000 to train a bomber pilot to drive a £1 million "taxi."

Beirut and its Air Transport Pattern

MIDDLE EAST AIRLINES, the network of whose routes radiate from Beirut as far afield as London, Karachi and Aden, tying those places to main centres in Europe and Asia Minor, was much in the news last week. Its forthright chairman and managing director, Sheikh Alamuddin had spoken his mind about a clash of interests between B.E.A. and B.O.A.C. And for good measure he had been pungent about infractions of IATA rules by member operators.

It is worth examining the context in which these comments came to be made and to see what may arise from them. It should be noted here, however, that as a member of the Executive Committee of IATA, the Sheikh has no doubt about the usefulness of its functions; what does concern him is how to provide it with more efficient sanctions.

Middle East Airlines came into being in 1945 and it is of interest that the present Lebanese Prime Minister, Saeb Bey Salaam, was associated with it. The company began with Dragon Rapides and from 1945-55 a 36% interest was held by Pan American Airways. This interest was taken over by B.O.A.C. in 1955 and expanded to 49%. The company acquired Viscounts and followed these with Comets. Four Comet 4Cs are on order, two of which have been delivered. An option on a fifth is being "nursed."

The Comet 4C has a 7-ft. longer fuselage but the same wing as the Mk. 4 (Jan. 22/60, p. 111). The particular version for M.E.A. seats 88 (five rows of four in the forward cabin, two rows of five in the middle and a further nine rows of six abreast in the after-cabin which, with one row of four makes a total of 88). Such high seating capacity with the frequency potential of the Comet clearly makes the company sensitive to competitive services.

The entry of Comet 4Cs into service in the M.E.A. network was discussed at length in our issue of Jan. 13. When the second of these machines was flown out on Feb. 16 it carried a party of 25 British journalists and, an historic first, their wives as well. The party, received by H.E. General Faoud Chehab, the Lebanese president, had a wonderful opportunity of seeing for themselves the touristic potentialities of the country which it is the Government's intention to develop intensively. Press conferences with the Prime Minister Saeb Bey Salaam and Sheikh Najib Alamuddin elucidated much information. Reference to the plans for developing the tourist business has been made in the editorial. It is clear that the airlines have the capacity to handle a steadily increasing traffic from Europe. Beirut, however, is not looking only to Europe for its visitors. These are coming increasingly from the oil countries around the Gulf and they are expected too from Africa.

As we all know, the outstanding fact about the Middle East

Guests were received (left) by Col. Cyril Essely, M.E.A. commercial controller, here seen greeting the Editor; Frank O'Shanohun looks on. Above, the party touring the hangars and workshops.

and Near East is the strong tide of Arab nationalism. This is something to which people in this country have always been sympathetic, yet many of us fail to realize how far things have moved since the days of Lawrence and his revolt in the desert. If it has still to become a reality Pan-Arabism is no longer a dream, and as so often happens it may well be that a decisive step to bring it to realization will first be taken in the world of aviation. Consideration of the situation of the airlines in the area shows that just as air transport operators in other parts of the World have formed consortia so the day may come when operators in the Arab world will come together. But nobody listening to Sheikh Alamuddin could think that such a grouping is likely to take place for a while yet.

United Arab Airways have now on order a fleet of five Comets and M.E.A. have four on order with an option for a fifth. Thus much of import hangs on the future of Saudi Arabian Airlines. There is talk that when the T.W.A. agreement expires in six months' time a new company with much capital provided by private sources will be formed able to purchase its fleet in the open market. When one considers that Kuwait and Gulf airlines are associated with B.O.A.C. it is easy to see how important the unifying link of the Corporation can be in a part of the World where the Comet is giving such a good account of itself.

For this reason, no doubt, the chairmen of B.E.A. and B.O.A.C. will study with interest the announcements made by Sheikh Alamuddin at his Press conference about the concern felt by Middle East Airlines with regard to the penetration of the area in which B.O.A.C. associates are so strongly interested by associates of B.E.A., namely Cyprus Airways and Olympic.

M.E.A. are looking forward to the expansion of their network to the Atlantic and eventually across it to South America. But it is not only in that area that rate-cutting exists, as well as the pernicious inducement of not charging for (and therefore not recording) excess baggage. Sheikh Alamuddin considers that it is not local traffic agents who are guilty—but representatives of big airlines. Interchangeability of tickets without endorsement would help to limit the practice.

Not for nothing is Lebanon known as the bridge and it is an illustrative fact that Ghana Airways, having purchased their freedom from B.O.A.C. (p. 198 refers) have appointed M.E.A. their agents. A further example is that during the unpleasantness over Suez the M.E.A. workshops at Beirut were able to see that the Viscounts of Misrair were kept flying.

Traffic rights are all the talk and in this connection the future of Air Liban is being discussed with interest. A grouping of the airline concerns in the Middle East could provide a consortium with a wide-ranging network. If such a consortium were dominated by the companies which have already found British aircraft so suitable for their purposes, the outlook would be inspiring.—T.J.

Bomber-destroyers in R.A.F. Service

IN July of last year No. 74 Squadron at R.A.F. Coltishall became the first operational Fighter Command squadron to start re-equipping with the English Electric Lightning F.1—the Service's first Mach 2 interceptor. Since then the next two day-fighter squadrons, Nos. 56 and 111 at R.A.F. Wattisham, have started to receive this new single-seat all-weather, day and night mount in place of their Hunter F.6s.

The Lightning F.1 is also supplementing the Command's Javelin force, and later models will in due course completely replace the two-seat fighter in the all-weather rôle. Even so, the initial part of the plan to re-equip the Hunter squadrons will close the operational gap between the United Kingdom's present day and night fighter forces.

Sixteen years ago No. 74, better known as the "Tiger" Squadron, together with other squadrons, was operating some of the first jet fighters in Fighter Command. Initially equipped with Meteor F.3s, it received the Meteor F.4 in December, 1947, and in October, 1950, started operating F.8s. The squadron flew this type until March, 1957, when it was introduced to the Hawker Hunter F.4. This in turn was replaced by the Hunter F.6 which the Tigers flew until they received their full quota of Lightnings.

Prior to the re-equipment of No. 74 Squadron, operational pilots had been participating in the development flying of the new interceptor since January, 1958. The first Lightning delivery to the R.A.F. was made in December, 1959, for Service trials and assessment by the Air Fighting Development Squadron of the Central Fighter Establishment. Tactical trials are still in progress and are scheduled to continue throughout the future development of the aircraft.

Apart from being the Service's first single-seat night fighter for many years, the Lightning is also Fighter Command's first integrated weapons system platform. It is capable of reaching a speed of Mach 0·9 in level flight at operational altitude within 2½ minutes from brake release, and can fly above 60,000 ft. In considerably less than 3½ minutes it can accelerate from the speed of sound to Mach 2.

Powered by two 11,250-lb.-thrust Rolls-Royce Avon RA.24R turbojets which, with full reheat, have a maximum thrust of 14,430 lb., the Lightning F.1 has three times the power of the Hunter. Later models are expected to have RB.146 Avon 300-series powerplants rated at 13,220 lb. dry.

The Chief of the Air Staff, Air Chief Marshal Sir Thomas Pike, has said that Lightnings will eventually be capable of 1,500 m.p.h. In July, 1957, it was announced that a prototype aircraft had exceeded 1,132 m.p.h. (Mach 1.73). By January, 1959, Mach 2 had been reached in level flight.

Conversion and Training

This very considerable improvement in performance and capability over any other Service fighter has not brought any outstanding conversion problems to the squadron. Except for the C.O., Sqn. Ldr. J. F. G. Howe, and his two flight commanders and their deputies, all of 74 Squadron's pilots have come straight from O.C.U. and are on their first day-fighter squadron tour. They are said to be average pilots, who have not been specially selected, and their flying experience varies between 500 and 3,000 hours.

Organized and operated by the Lightning Conversion Unit (L.C.U.) staffed by a small group of officers, the conversion programme is made up of lectures, practical instruction with the aid of a General Precision Systems Mk. I Lightning simulator, and actual flying sorties.

It starts with a five-day aviation medicine course during which pilots are fitted out with their new flying clothing and undergo physiological tests at an aero medical centre. Returning to the squadron they then have seven days of lectures from members of the L.C.U., covering the aircraft's systems, emergency drills, handling, performance and so on, before starting simulator training.

This comprises 11 one-hour sorties covering cockpit drills, handling and all possible emergencies. On the tenth simulated sortie they get "everything thrown at them" and the final period consists of a pre-solo flight check.

The first solo trip in the Lightning includes flying away from the airfield circuit and the pilots obtain their first experience of the Lightning's most outstanding difference from all other R.A.F. aircraft—its acceleration and rate of climb. Rejoining the circuit they complete a couple of ground controlled approach passes which are followed by either a GCA or visual approach and landing.

Before each airborne exercise a total of 10 general aircraft handling and navigational sorties are made with preflight simulator trips. These operations are followed by weapon training conversion which starts with two days of lectures on the comprehensive weapons system. As with the handling programme, exercises are first made in the simulator before being undertaken in the air; approximately 20 one-hour weapon sorties are flown in the simulator.

The first dusk and night flights are made during the weapon training phase and night weapon sorties, similar to the day exercises, are then completed. At the end of the night weapon training programme, a converted pilot is considered to be fully operational and up to combat-qualified level.

During the conversion period all pilots fire the Lightning's two 30-mm. Aden guns but familiarization with the de Havilland Firestreak air-to-air missiles is limited to interceptor flights against Hunters, Javelins, V-bombers and other Lightnings using acquisition heads. It is intended that each pilot will have an opportunity to fire an operational Firestreak, without a warhead, against a target drone such as a Meteor U.15 or U.16, or a Jindivik, during his tour (2½-3 years) with a squadron.

No. 74 Squadron now has a similar number of Lightnings to its previous Hunter strength and its planned flying target is the same as for day-fighter squadrons, although there is much greater emphasis on night flying. Later this year, after the L.C.U. has been equipped, the squadron will receive its first two-seat Lightning T.4 for instrument flying and weapon training instruction.

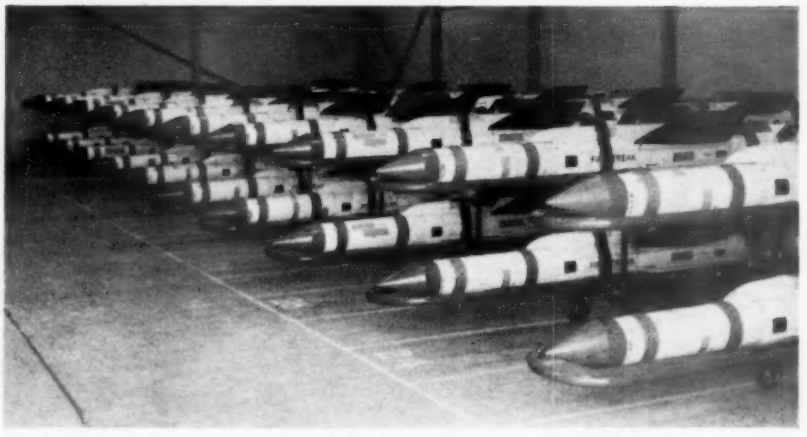
The introduction of the Lightning at Coltishall has brought with it a number of other interesting modifications and changes to station and squadron operating techniques. For example, because of the aircraft's extremely high rate of climb and steep climbing angle after take-off, additional aircraft surveillance radar has been introduced to monitor it out on its climbing lane. The radar is also employed as an extra aid for fighter recovery at the end of a sortie.

Conversion to the Lightning also introduces new navigation and landing aids to the former Hunter F.6 pilot. These include TACAN and ILS, and the use of a 16-ft. dia. G.Q. tail parachute as part of the normal braking procedure after touch-down.
—P.B.R.

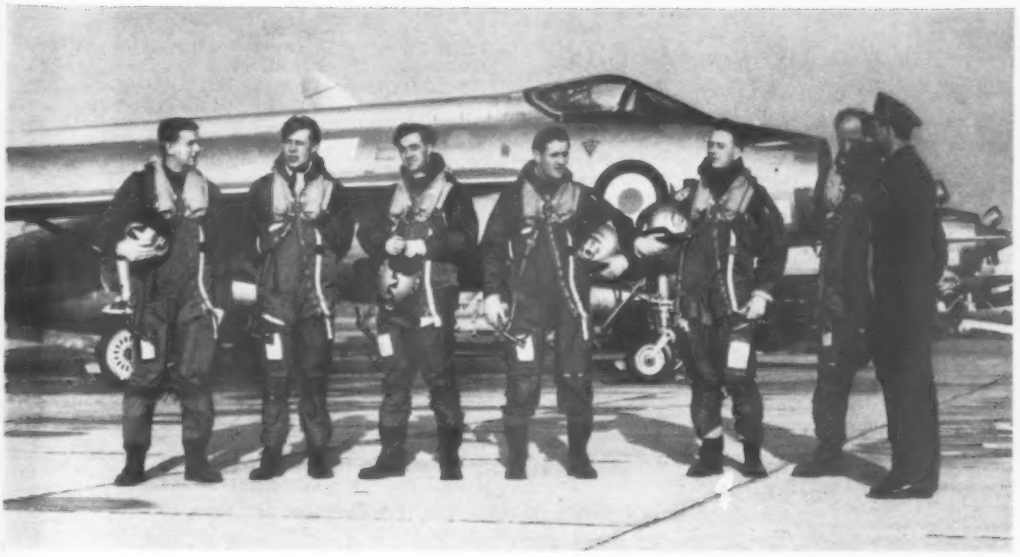
Left, groundcrew testing the two Rolls-Royce Avon RA.24R turbojets of a No. 74 Squadron Lightning.

Below, a pair of interceptors taking off from the 2,500-yd. runway at Coltishall. Lightning pilots like to have this length of runway available, although the aircraft does not normally require more than 2,000 yd. for landing and can be brought to rest in 800 yd.

Right, pairs of operational Firestreak AAMs in their handling cradles in one of the ready-for-use storage buildings belonging to the station Guided Weapons Squadron.



Far right, No. 74 Squadron Lightnings at dispersal at Coltishall. Progressive servicing with three groundcrew teams, each under the charge of a chief technician, has been introduced to maintain the aircraft under the overall command of the Squadron's engineering officer.



Left, the C.O., Sqn. Ldr. Howe (extreme right), with some of his pilots. Lightning flying clothing at Coltishall includes immersion suits, partial pressure jerkins and g-suits, but this last-named item cannot be worn during the winter months while immersion suits are in use.

"Tiger" Lightnings

First operational squadron in R.A.F. Fighter Command to have the distinction of being equipped with the supersonic English Electric Lightning F.1 is No. 74 "Tiger" Squadron (Sqn. Ldr. J. F. G. Howe) based at Coltishall. Previously operating Hunter F.6s, the Squadron is now, with its Lightnings, flying in an all-weather day and night role.

Photographs copyright "The Aeroplane and Astronautics"

Air Transport

Profitless Prosperity

LAST month's news of Scandinavian Airlines System's loss of nearly £6 million during the business year which ended on Sept. 30, 1960, and the pessimistic writings in U.S. financial journals provide a reminder (if one was needed) of the price which is still being paid retrospectively for the airlines' massive turbojet re-equipment programme.

Although S.A.S.'s revenues rose by about £7 million to more than £45 million, the increases have not kept pace with the amortization and other losses associated with large-scale re-equipment and with the difficulty in selling piston-engined aircraft. The airline expects a deficit for the present year, but hopes for an improvement in 1961-62.

In the same way the U.S. trunk airlines, though not actually losing money, have been hard pressed in their repayment schedules for the big turbojets and some are now concerned with the need to raise money for a second (short-medium-haul) round of turbojet buying. The situation can best be described by the phrase coined by American Airlines in 1957 when a spokesman said that the airline situation was one of "profitless prosperity."

The irony of the whole thing is that the U.S. manufacturers of the turbojet equipment have, by and large, lost heavily on the programme and only Boeing has reached the point of showing a small profit on new 707s and 720s. A recent issue of *Forbes*, the U.S. journal, hits hard at the aircraft industry under the heading "The $1,000-million Lesson," explaining how the four major manufacturers have spent a combined $700 million on the development of commercial airliners to supply a market which could not have involved more than 500-600 aircraft worth about $2,500 million.

"The investment was, on the face of it," the article continued, "bad arithmetic. Even the most elementary kind of market survey would have told them that." It goes on to say, categorically, that the manufacturers "failed to appreciate their own *rôles*. Aeronautics is essentially defence; the rest is intrinsically a sideline, a diversion." The "lesson" of the title is that the industry's fortunes depend on government spending and that "commercial ventures are dangerous for defence contractors."

We on this side of the Atlantic can hardly hope that the Big Four of the U.S. industry will take this criticism so seriously that they will stop trying—and thus leave the U.K. and Europe with the prospectively profitable job of supplying all succeeding generations of transport aircraft.

More Turbofan Boeings

PAN AMERICAN AIRWAYS last week ordered five more Boeing 707s in the new turbofan-powered -320B version. This model, for 1962 delivery, is similar to the present 707-320 Intercontinental series but has 18,000-lb. Pratt & Whitney JT3D-3 turbofan engines, and improved high-lift devices on the wing. Its place in the general programme of "product improvement" for the Boeing 707/720 family was discussed in our issue for Dec. 2 last. The Pan American model will be the 707-321B, and deliveries to this customer, which has taken an option on five more, are expected to begin in Mar. 1962.

The use of the turbofan engines gives the -320B approximately 15% more range than the -320, and the ability to carry a space-limited 40,000-lb. payload (141 passengers, baggage and freight) for 4,690 naut. miles. The maximum taxi weight has been increased to 317,000 lb., and the maximum weight-limited payload is 56,000 lb. Water injection is used to retain the full take-off power of the engines in high temperatures and at high altitude airports. As we explained in the Dec. 2 issue, the greater range potential of the -320B can be used to obtain higher cruising speeds over non-critical sector distances (such as the North Atlantic) and so maintain a competitive advantage over earlier-model 707s.

Improvements to the wing leading and trailing edges include the use of a plain flap over the wing-root fillet to obtain better characteristics than those of the present split flap. The leading edge flaps will be full-span, and are so arranged as to have a slotted effect, not obtained with the leading-edge flaps at present in use. Both these developments have recently been flown on the prototype Boeing "dash 80" at Seattle.

Ghana Buys its Airline

AS expected, the Ghana Government has now purchased B.O.A.C.'s share in Ghana Airways, which therefore becomes a wholly state-owned company. B.O.A.C. has had a 40% interest in Ghana Airways since its formation in 1958, and this has now been sold for £160,000 (see our issue for Feb. 3).

B.O.A.C. Associated Companies has relinquished its membership on the board of Ghana Airways, but a revised agreement has been concluded between these two companies to continue their existing co-operation. Under the new agreement, B.O.A.C.A.C. will continue the programme of training which is intended, eventually, to allow Ghanaian nationals to take over the management, administration and operation of the airline. Technical assistance will be provided where possible.

Commenting on the acquisition of its shares by the Ghana Government, B.O.A.C. said "it has been glad to assist in bringing the airline to the stage where the Ghana Government is able to assume full ownership and looks forward to continuing in the future the excellent relationship built up over recent years."

The Brussels Disaster

AT the time of going to press with this issue no positive information had become available about the likely causes of the loss of Sabena's Boeing 707-329 near Brussels National Airport, Melsbroeck, on Feb. 15. Even the events immediately preceding the disaster had not been completely clarified.

So far as the various reports can be knitted together, overshoot action had been taken during a normal approach to runway 20/02 in good weather. The 707 then started to climb away, but turned "in an abnormal attitude" before crashing near the village of Berg, which is about three miles ENE of Melsbroeck. The 61 passengers, the crew of 11 and one person on the ground were killed.

It appears that the 707, which had flown non-stop from New York, had not been in successful contact with Brussels approach control which, it was reported, made several attempts to raise the aircraft on different frequencies. The flight recorder has been recovered from the wreckage and the tape may help to provide essential information.

Upper Airspace Control

AS part of the first stage in the development of an upper area control service, operational trials of overall U.K. radar cover are continuing and details are given in NOTAM No. 64/1961. The trials cover much of the western areas of the London, Preston and Scottish Flight and Upper Information Regions

All aircraft flying above 25,000 ft. are expected to use the service and those equipped with transponders may be asked to switch them on so that secondary radar can be used to improve the service. The success of the trials depends on the the co-operation of pilots and they are asked to forward their comments to the M.o.A.

CONTROVERSIAL TERMINAL.—A view of the control tower and part of the terminal building at Rome's new Fiumicino Airport which was opened to traffic last month.

Air Transport . . . .

The Air-freight Business

SOME fairly substantial North Atlantic freight reductions have, as briefly noted in last week's issue (p. 166), been announced by B.O.A.C., Pan American and T.W.A. for application after Apr. 9 if no agreement is reached within IATA in the meantime.

More important is the fact that they propose a simpler tariff system based on so-called "weight breaks"—the bigger the consignment weight the lower the cost—and with, at least in the case of the U.S. airlines, commodity rates applying only to certain specific goods.

Only the specialist will know whether these reductions in the basic rates will be really advantageous in the majority of cases when compared with the complicated special commodity systems at present in use.

Typical reductions by Pan American and T.W.A. will be 32% (down to 13s. 7d. per kg.) for shipments under 45 kg.; 46% (to 8s. 2d. per kg.) for 100-250 kg. shipments; 48% (7s. 10d.) for 250-500 kg.; 48% (6s. 9d.) for 1,000-75,000 kg.; and 63% (4s. 10d.) for shipments of 75,000 kg. or more.

B.O.A.C.'s prospective cuts will be even more marked. London-New York rates will be reduced by 63% (to 7s. 6d. per kg.) for shipments of 100-250 kg.; by 68% (to 6s. 4d.) for 250-500 kg.; by 73% (to 5s. 6d.) for 500-1,000 kg; and by 76% (to 4s. 10d.) for consignments of 1,000 kg. or more.

K.L.M. believes that the present system (which is almost exclusively based on differentials by commodity) should be greatly simplified and that a rate differential by size of shipment should be introduced. Its proposals involved, a statement explains, "substantial reductions for shippers," adding that those of American carriers "would have resulted in increases of rates for a large proportion of present traffic." K.L.M. also advocated special low rates for shipments of, say, 10 tons, regardless of commodity, but this was opposed.

No doubt when the bigger North Atlantic operators of freight services (and their respective governments) have seen each other's proposals there will be some attempt to come to terms. Whatever happens, the shipper is likely to get rates which are not only lower but much simplified in relation to those which are at present agreed.

A New Pattern of Services

TWO of the three interrelated developments which were announced last week by Silver City Airways are likely, in the long term, to alter very considerably the present patterns of public travel between the U.K. and the Continent.

These are the introduction of through passenger (and, later, vehicle/passenger) services from eight centres in England and Scotland to Le Touquet, Calais and Cherbourg; and the building, at Le Touquet, of an airport station and a railway spur line which will link it with the French railway system. The third development—of parallel French vehicle-ferry services by Compagnie Air Transport—may change the present nine (British) to one (Continental) ratio of cars crossing the Channel by air.

The full system of passenger- and vehicle-ferry services will be offered to the travelling public for next year's summer season—when the spur between Etaples and Le Touquet and the airport station will have been completed. Obviously a series of operations of this magnitude will need to be completely integrated for success in terms of maximum traffic and aircraft utilization, but some all-passenger services from U.K. domestic points to Le Touquet may be operated during this year. The British towns and cities concerned in the pattern are Blackpool, Liverpool, Manchester, Leeds/Bradford, Birmingham, Newcastle, Edinburgh and Glasgow.

For the 1962 operations the Silver City fleet will need to be augmented by bigger aircraft, with adequate capacity for passengers as well as for two or more vehicles. Since the transport of vehicles will, over stage distances such as that between Glasgow and Le Touquet, be fairly costly for the motorist, the economics of the network are likely to depend on passenger- rather than on vehicle-transport—at least until new habits are formed by the wealthier motorists—and the aircraft will need to be of a type which will be able to break-even on passenger loads alone.

Silver City will not, at present, say more about re-equipment than that the aircraft should preferably be of Anglo-French origin. Obviously it cannot be, with so little time available, an entirely new type: it must be an existing aircraft which has been suitably modified for the job. In all the circumstances there would appear to be only one possible choice—that of a Breguet Deux Ponts variant. The 763, of which Air France now has 12, is capable of carrying about 60 passengers with a freight load equivalent to about 22,000 lb., and it has the kind of fuselage capacity which is required. Maybe there was some significance in the fact that, at last week's Press conference, a small model of the Deux Ponts was on view—though very modestly so.

The new services and the railway spur and station will offer interesting prospects for travellers of different kinds. The non-motoring passengers will be able to fly non-stop from any one of the eight U.K. centres to Cherbourg, Calais, or, in particular, Le Touquet—whence they will be able to continue their journey by train to any point in Europe. The motorist will be able to avoid the drive southwards through England and start his journey in France. If he wants to avoid long-distance motoring altogether, then he can arrange for his car to travel on the train from Le Touquet.

An interrelated part of the total arrangement is that whereby Compagnie Air Transport will go into partnership with Silver City in the operation of vehicle-ferry services. The French company has bought three of Silver City's Bristol 170 Mk. 32s, and passenger/vehicle services will be operated under C.A.T. colours from Le Touquet and Calais to Lydd, from Cherbourg to Hurn (Bournemouth) and possibly, from Calais to Southend.

Significantly enough, the principal shareholder in C.A.T.—which has been an essentially non-operating partner during the past four years on the London-Paris Silver Arrow services—is French Railways. The co-operative arrangement has many possible advantages in the development of the integrated air-rail and vehicle services.

Discussing Visual Aids

A FEATURE of international meetings on practical airworthiness and associated problems which continues to be encouraging is the increasing and necessary part which is being played by practising airline pilots. At the first meeting of the ICAO Visual Aids Panel (November/December last year), for instance, the chair was taken by an IFALPA member—though the Association is, in fact, no more than an "observing body." In this case the member was encouraged to remain uninhibited by his chairman's responsibilities and to put IFALPA's views as a matter of course.

This initial meeting of the panel (in Montreal) dealt with visual glide-slope indicators and exchanged views on approach and runway lighting in general. The operational requirements for V.G.S.I. had first to be laid down and after three days' work a pattern was agreed.

Briefly, the requirements were that the system should enable the pilot to hold an established glide-slope within reasonable limits at all times from interception to a point as close as possible to touchdown; be reliable; be easily identifiable and distinguishable from other visual aids or lights; be easy to learn and to interpret and be unambiguous; have an acceptable degree of sensitivity and range in all weather conditions; be adjustable between 2° and 4°; and be capable of obstruction-free installation without interference with other visual or non-visual aids.

The two contenders for the ICAO Standard were the R.A.E. two-colour indicator (the interpretation of which depends on colour discrimination in steps) and the Australian T-bar indicator (which depends on continuous alignment or misalignment discrimination). After discussions and explanations the two systems were judged by a form of secret ballot using votes under six headings for the different agreed operational requirements.

The voting was fairly close, though firmly in favour of the R.A.E. system, which, in any case, has considerable advantages in terms of availability in the U.K. and (following its recent adoption) in the U.S.A. The further development and evaluation of other systems were, however, recommended.

As a matter of interest, the voting showed the Australian system to be decisively better only in its ease of interpretation and lack of ambiguity, but, of a total of 84 marks (for six variations of opinion in comparative performance under 12 operational-requirement headings) as many as 40 were in the "equal," or "no better" column.

It was recommended that V.G.S.I.s should be installed, regardless of any other aids, for runways used by aircraft for which an approach path must be maintained within fine limits; and for those where difficulties might be experienced in judging an approach because of inadequate or misleading visual information, where obstructions caused serious hazards, where specially accurate approaches were necessary, and where there was unusual turbulence on the approach path.

Six IFALPA members had attended an earlier ICAO meeting

D

Air Transport . . . .

—the fourth of the Airworthiness Committee (October/November, 1960)—at which a number of vital subjects, including gust criteria and static-system errors, were discussed. It is not generally appreciated that static errors can be very important in other contexts than that of altitude measurement. Accumulated errors could, as the Association pointed out, result in airspeed errors as great as 10 kt. in the take-off regime—and calculations of runway lengths, obstacle clearance and gross weights are based on rotation speeds with a very much narrower margin.

Future work for the Airworthiness Committee includes that on pilots' field of vision (which has been on the agenda for four years while aircraft have been built with unacceptably low standards of cockpit visibility) and on the standardization of flight-instrument presentation.

Getting to London Airport

NEITHER B.E.A. nor B.O.A.C. is satisfied with existing or projected road access to London Airport from the centre of London. Although the improvements already made or now being made as part of the South Wales Radial road scheme have served to speed up the coach time between the West London Air Terminal and the airport to about 35 minutes, or a little more for Airways Terminal at Victoria, the situation will deteriorate as both the number of passengers using the airport and the amount of traffic on the road increases.

Lord Douglas made clear last week that the Corporations believe some form of rail link to be essential. He was speaking on the occasion of a presentation to B.E.A. and B.O.A.C. executives of details of two monorail systems, but said that such a system was only one of various possibilities, and the decision as to which system should be used was a matter for the Ministry of Transport. Both B.E.A. and B.O.A.C. would be prepared to make a contribution towards the capital cost of a rail link—in the case of B.E.A., the sum of £1 million was mentioned.

The monorail systems presented were the French SAFEGE overhead suspension rail system and the West German Alweg straddle monorail system. In both cases, pneumatic-tyred coaches run on elevated tracks, offering a fast and quiet means of transport. The cost of these systems is higher than that of laying a conventional surface railway track, but very considerably less than that of an underground railway.

British Railways has studied an alternative scheme using existing routes from Victoria to Feltham, possibly with additional tracks, and a spur from Feltham to the airport. All schemes have to face the difficulty of getting into the central area by means of an underground link.

1961 Friendships

BY the middle of this year Fokker expect to have certification of the F-27 Friendship at increased gross weights which will offer significant improvements in payload-range performance. The max. permissible weight of the Series 100 (passenger) and Series 300 (freight) F-27s with Dart 511 (R.Da.6) engines will be increased from 37,500 lb. to 39,000 lb. while that of the Series 200 (passenger) and Series 400 (freight) F-27s with Dart 528 (R.Da.7) will go up from 37,000 lb. to 42,000 lb.

In the case of those aircraft having Dart 511-7E engines, the new weight will be allowable in temperatures up to 31° C. at sea level, while those having Dart 528-7E engines will be allowed to operate at 42,000 lb. in temperatures up to 40° C. at sea level. The -7E engines have Nimonic 105 turbine blades allowing maximum continuous JPTs of 625° C. and 820° C. respectively.

The effect of these increased weights is shown in the following table, indicating the ranges which can be flown with various payloads. The costs are based on S.B.A.C. methods "adjusted to F-27 experience," assuming 3,000 hr. annual utilization, I.S.A., still air with fuel reserves for 200 naut. miles, 45 minutes holding and 5% contingency. In all the examples quoted, Dart 528 versions of the F-27 are assumed.

PAYLOAD	SECTOR n.m.	BLOCK TIME hr.	min.	D.O.C. *pence/seat n. m. or †pence/short ton n.m.
Friendship				
8,700 lb. (40 pass.) ..	1,100	4	42	*1.14
9,400 lb. (44 pass.) ..	1,080	4	37	*1.04
10,300 lb. (48 pass.) ..	960	4	9	*0.96
10,400 lb. (52 pass.) ..	910	4	0	*0.89
Freightship				
13,400 lb.	550	2	27	†7.25
Combiplane				
11,964 lb. (28 pass. and 5,964 lb. freight) ..	730	3	12	*0.858 †8.0

Air Guinée

AIRCRAFT and crews from Russia and Czechoslovakia have been supplied to the Republic of Guinea to equip Air Guinée, one of the several new operators which have recently appeared in West and Central Africa. With two Ilyushin Il-18Bs and three Czech-built Ilyushin Il-14s, Air Guinée is flying domestic services and one route across the border into the Mali Republic, although details of the schedules do not yet appear in the *ABC World Airways Guide*.

According to a correspondent in the area, the two Il-18s were ex-Aeroflot machines, and as the photograph shows, Aeroflot livery has been retained, only the name, registration and national flag being changed. Two of the piston-engined Ilyushins are the Avia 14-32A Super type, with 32 passenger seats, and the third is an Avia 14T freighter. The registrations of these aircraft are derived from the names of local towns, as 3X-CKY (from Conakry), 3X-BKE (from Boke) and 3X-NZE (from N'zerekore). Another Avia 14, with VIP interior, is set aside for use by the President of the Republic of Guinea and is registered accordingly 3X-PRG (see our issue for Feb. 10).

Routes flown at present are from Conakry to Kankan, Boke and N'zerekore in Guinea and to Bamako in Mali. The Il-18s are scheduled to introduce services to Moscow and to Cairo via Accra in due course. Conakry, the capital of Guinea, has a 5,900 ft. tarmac runway at its airport, with a secondary 3,770 ft. laterite runway, and a two-year-old terminal building. Plans have been reported to lengthen and strengthen the main runway. Apart from Air Guinée the airport is used regularly by Air France, K.L.M., U.A.T., Ghana Airways and C.S.A. Both Ethiopian Air Lines and United Arab Airlines have announced plans to serve Conakry soon.

AFRICAN AIRLINE.—Delivered early this year, the Ilyushin Il-18 seen here at Dakar is one of two now operating in the markings of Air Guinée, the national carrier of the newly independent West African state. A note on Air Guinée appears on this page.

The Fighting Services

Air Rank Appointments

AIR COMMODORE E. G. JONES, C.B., C.B.E., D.S.O., D.F.C., is to become A.O.C., R.A.F. Germany, in April, with the acting rank of Air Vice-Marshal.

Assistant Chief of Staff (Intelligence) at Headquarters, Allied Air Forces Central Europe, since July of last year, Air Cdre. Jones was previously Commandant of the Central Reconnaissance Establishment at Brampton. Before going to Brampton he commanded the reconnaissance base at Wyton.

Air Cdre. J. H. Lapsley, O.B.E., D.F.C., A.F.C., has become Deputy Chief of Staff (Air) at Headquarters, 2nd A.T.A.F., Germany, in succession to Air Cdre. R. J. B. Burns, C.B.E., who has been appointed Director of Flight Safety at the Air Ministry.

Until recently, Air Cdre. Lapsley had been Deputy Director of Joint Plans at the Air Ministry, before which he was Group Captain, Operations, with the 2nd T.A.F. in Germany. Air Cdre. Burns was Senior Officer in charge of Administration at Headquarters, No. 29 Group, from 1951 to 1954, he subsequently commanded R.A.F. Ternhill and later R.A.F. Wildenrath, Germany.

Air Cdre. E. M. Donaldson Retires

SO the last serving member of another of the legendary R.A.F. families has left the Service. Air Cdre. E. M. "Teddy" Donaldson, C.B., C.B.E., D.S.O., A.F.C. and Bar, U.S. Legion of Merit, for the past two years Commandant of the R.A.F. Flying College, Manby, retired on Feb. 21, to join the *Daily Telegraph* as assistant air correspondent.

One of the four brothers, Donald, settled in New Zealand at an early age. The other three, encouraged by their mother, joined the R.A.F. and made her proud and delighted by each winning the D.S.O. and A.F.C. John Willie lost his life with the Navy off Norway; Arthur retired about two years ago as a Group Captain; and now it's Teddy's turn, after 30 years' service.

He will probably be remembered chiefly for flying a Meteor 4 to the limits of controllability, a few feet above the Channel, when he set up, in September, 1946, a World Speed Record of 616 m.p.h. and got the Britannia Trophy for it. Ever since he joined the R.A.F. in 1931 he has got results. While with No. 3 Squadron at Kenley he won the R.A.F. Featherweight title; and his skill with the pistol, plus his fine "airman's hands," helped him win the Brooke-Popham Air Firing Trophy twice—the only man to do so.

No doubt this all contributed to his shooting down 10 enemy aircraft in the Battle of Britain. He was then commanding 151 Squadron and wore, briefly, a large blonde moustache which moved me to sketch him at North Weald. Later, he was shot down near the French coast and was picked up by a rescue launch which was looking for somebody else.

Before those crowded days, he'd led a new kind of aerobatic team (see drawing) which had in 1937 flown at the Hendon Air Display and the Zurich International Air Rally.

In 1941, after the Battle of Britain, he became chief instructor at the Air Fighting Training School at Ternhill and later he organized gunnery schools in America, spending two years there. When the jets came, he was selected for the command of the first jet base, at Colerne. After his Speed Record achievement, Air Ministry had a flash of inspiration and appointed him Commandant of the Air Training Corps for two years.

In 1957, he commanded R.A.F. Fassberg, then took a Joint Services Staff College Course, followed by a posting to Air Ministry as Deputy Director of Training (Operations). Before he went to Manby, he was Deputy Commander, Air Forces, Arabian Peninsula.

Teddy Donaldson is fully qualified to give the sound advice: "Never let burning ambition ruin your enjoyment of the best job in the World."—WREN.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. A. D. Jackson and Wg. Cdr. A. M. K. Phillips to the Department of the Chief of the Air Staff; Wg. Cdr. D. H. Beckett, O.B.E., and Wg. Cdr. A. E. G. Pye to the Department of the Air Member for Supply and Organization.

Bomber Command: Wg. Cdr. A. H. Chamberlain, A.F.C., to R.A.F. Wittering to command No. 49 Squadron; Wg. Cdr. G. Sproates to R.A.F. Feltwell as Wg. Cdr., Operations.

Fighter Command: Gp. Capt. J. Ellis, C.B.E., D.F.C., to Headquarters as Senior Personnel Staff Officer; Wg. Cdr. E. Batchelar to R.A.F. Leconfield to command the Flying Wing.

Transport Command: Gp. Capt. I. J. Spencer, D.F.C., to Headquarters, No. 38 Group, as Senior Officer Administration; Sqn. Ldr. E. K. Adair to Headquarters as Staff Officer to the Inspector-General of Air Transport, with acting rank of Wg. Cdr.

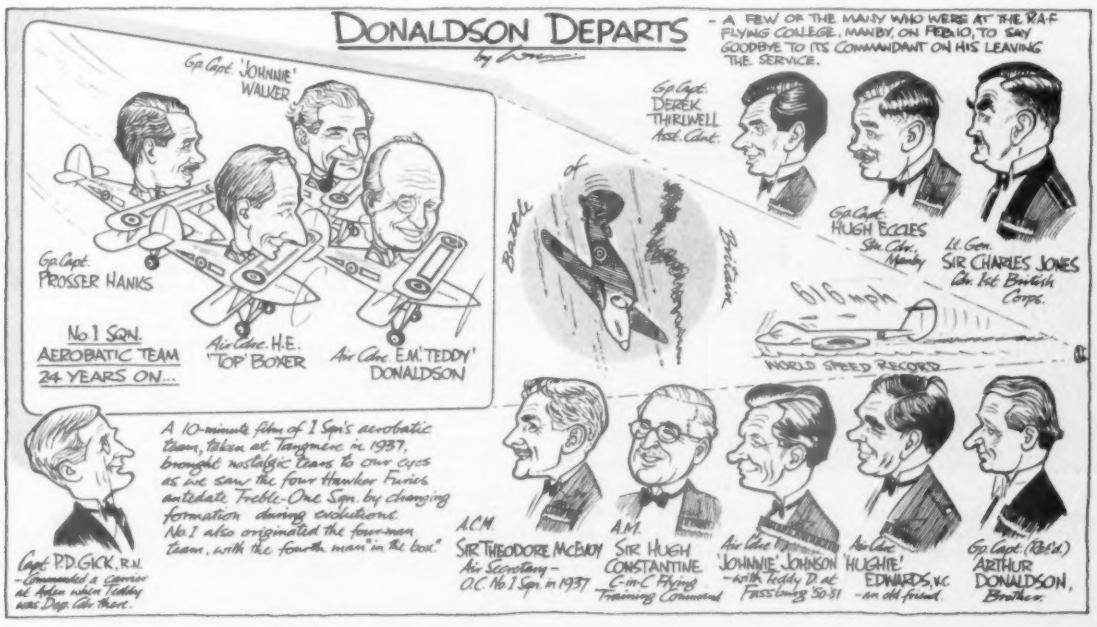
Maintenance Command: Sqn. Ldr. A. M. M. Hill, D.F.C., D.F.M., to No. 35 Maintenance Unit, Heywood, as Provision and Stock Control Officer, with acting rank of Wg. Cdr.

R.A.F. Germany: Gp. Capt. D. B. Bretherton, D.F.C., to R.A.F. Uedem as Air Defence Commander and R.A.F. Goch to command.

Middle East Air Force: Wg. Cdr. C. J. W. Soutar, M.B.E., M.B., B.S., L.M.S.S.A., D.P.H., D.I.H., to R.A.F. Nicosia, Cyprus, as Senior Medical Officer.

British Forces Arabian Peninsula: Gp. Capt. T. J. Hanlon, C.B.E., to R.A.F. Steamer Point to command; Gp. Capt. S. J. Popham-Pursey, O.B.E., to Headquarters, Air Forces Arabian Peninsula as Senior Equipment Staff Officer; Gp. Capt. H. H. S. Brown, A.F.C., M.B., B.S., D.P.H., to the R.A.F. Hospital, Aden, to command; Wg. Cdr. R. S. Peill, M.B., Ch.B., D.A., to the R.A.F. Hospital Bahrein, to command.

Other Appointments: Gp. Capt. W. G. Devas, C.B.E., D.F.C., A.F.C., to Allied Air Forces Northern Europe as Assistant Chief of Staff, Operations and Training; Wg. Cdr. I. E. Miller to Allied Air Forces Northern Europe for accounts, personnel and statistics duties; Wg. Cdr. L. R. Mumby, O.B.E., to Air Headquarters, Malta, as Senior Equipment Staff Officer; Sqn. Ldr. J. R. Wilcock, A.F.C., to R.A.F. Takali, Malta, to command the Communication and Target Towing Squadron; Wg. Cdr. S. H. Martin to Allied Forces Northern Europe as Staff Officer, Plans; Wg. Cdr. S. C. Rexford-Welch, M.R.C.S., L.R.C.P., to the U.S.A.F. School of Aviation Medicine; Sqn. Ldr. A. A. R. L. M. Morris to the Ministry of Aviation, with acting rank of Wg. Cdr.


DONALDSON DEPARTS
by
- A FEW OF THE MANY WHO WERE AT THE R.A.F. FLYING COLLEGE, MANBY, ON FEB. 10, TO SAY GOODBYE TO ITS COMMANDANT ON HIS LEAVING THE SERVICE.
Gp Capt. 'JOHNNIE' WALKER
Gp Capt. PROSSER HANKS
No. 1 SQN. AEROBATIC TEAM 24 YEARS ON...
Air Cdre. H.E. 'TOP' BOXER
Air Cdre E.M. 'TEDDY' DONALDSON
A 10-minute film of 1 Sqn's aerobatic team, taken at Tangmere in 1937, brought nostalgic tears to our eyes as we saw the four Hawker Furies antedate Treble-One Sqn. by changing formation during evolutions. No. 1 also originated the four-man team, with the fourth man "in the box."
Capt. P.D. GICK, R.N. - Commanded a Cruiser at Malta when Teddy was Flag Cdr. there.
Gp Capt. DEREK THIRLWELL Asst. Cdant.
Gp Capt. HUGH ECCLES Stn. Cdr., Manby
Lt. Gen. SIR CHARLES JONES Cdr. 1st British Corps.
Battle of Britain
616 m.p.h.
WORLD SPEED RECORD
A.C.M. SIR THEODORE McBRIDE Air Secretary - O.C. No. 1 Sqn. in 1937
A.M. SIR HUGH CONSTANTINE C-in-C Flying Training Command
Air Cdre 'JOHNNIE' JOHNSON - with Teddy D. at Fassberg 50-51
Air Cdre. 'HUGHIE' EDWARDS, V.C. - an old friend.
Gp Capt. (Retd.) ARTHUR DONALDSON, Brother.

Canada's Topside Sounder

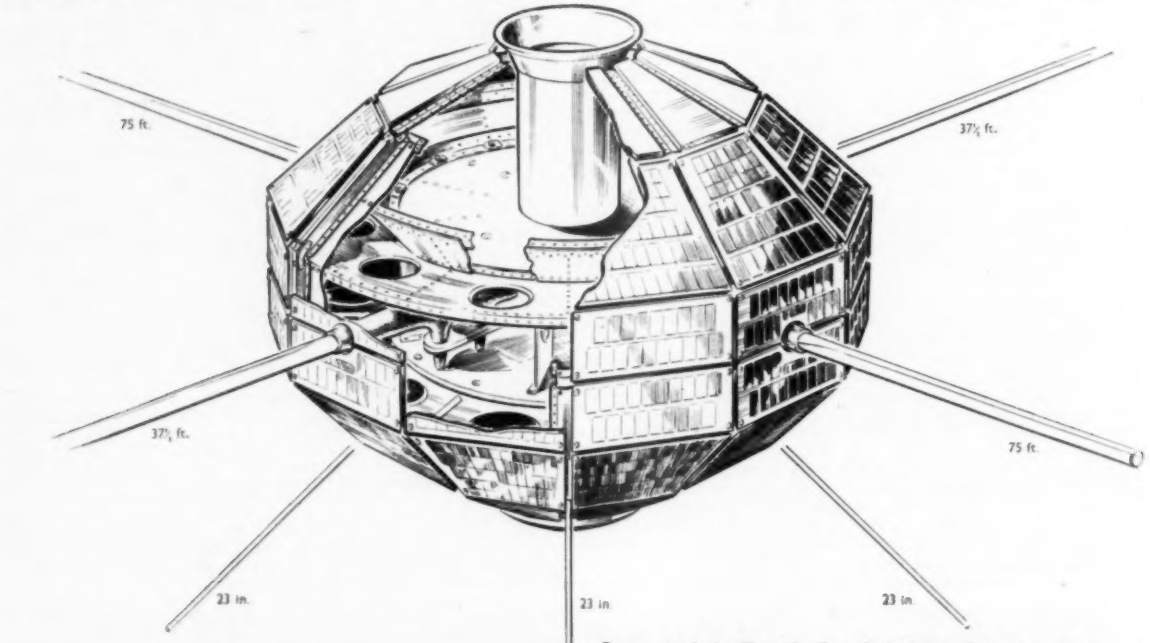
KENNETH GATLAND describes an advanced satellite system which is being designed and produced within the British Commonwealth

WHILE British official participation in space-research is still limited to the provision of small instrument payloads for the NASA satellite S-51, Canada is going ahead with a satellite of her own. This is the S-27 Topside Sounder project which the Defence Research Telecommunications Establishment of Canada is developing in a co-operative programme with NASA.

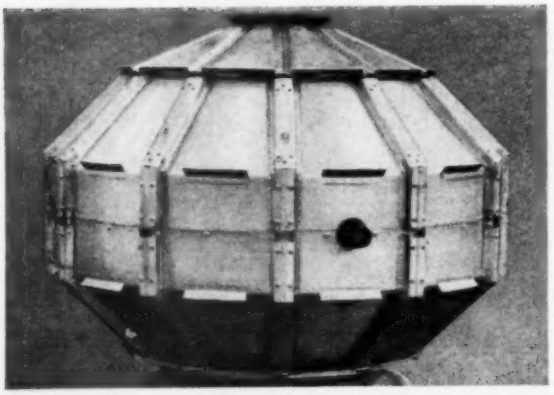
This venture, however, involves much more than the provision of instrumentation. Canada is building the complete satellite and will also operate a network of receiving stations for recovering telemetered data. Moreover, the Hawker Siddeley Group which, in the United Kingdom has an interest in communication satellites, is deeply involved in this project by virtue of the participation of The de Havilland Aircraft of Canada. The Canadian company, under contract with D.R.T.E., is responsible for the design and construction of the satellite structure and the vehicle's unique extendible antennae.

Object of the programme is to gain more information on the electrified region in the upper atmosphere which constitutes the ionosphere. At present, it is possible to obtain only a limited amount of information by reflecting radio signals from the bottom side of the ionosphere—up to about 200 miles—at approximately 140 locations throughout the World. Soundings obtained with the Canadian satellite should extend investigations to altitudes of about 700 miles and, moreover, furnish information for geographical areas which are not covered by the present ground station network.

In operation, the Canadian sweep frequency sounder will emit radio signals, the frequency of which will range from 2 to 12 M/cs. This will provide a means of obtaining information on the characteristics of the upper ionosphere at different frequencies by finding out how these signals are reflected and absorbed



Features of the Topside Sounder's internal construction are shown in this drawing. The satellite casing is 42 in. wide and 34 in. deep. The rectangular pads represent silicon solar cells.



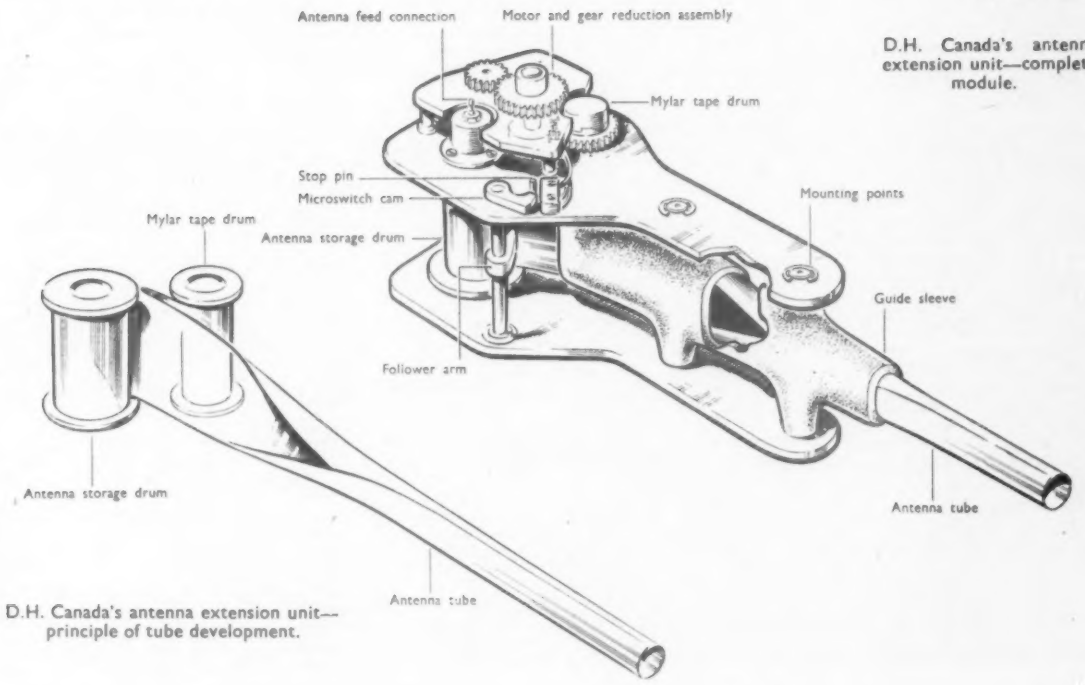
Payload structure for the S-27 sweep-frequency Topside Sounder satellite, designed and manufactured for D.R.T.E. by The de Havilland Aircraft of Canada.

The Defence Research Telecommunications Establishment—a research agency of the Defence Research Board of Canada—is responsible for all aspects of the satellite payload. This includes design and fabrication of the satellite package and the design and construction of all the electronics necessary for both the sounding experiment and the telemetry link.

Two phases of the S-27 programme have been turned over to private industry. These include development of the satellite shell and antenna system—by de Havilland—and the electrical design and development of the sounding and telemetry antennae by Sinclair Radio Laboratories of Toronto for the sounder antennae.

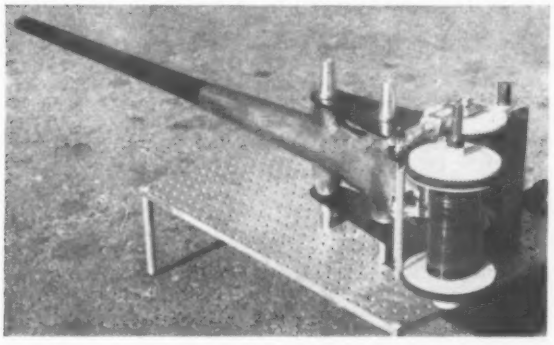
The de Havilland Aircraft of Canada are making four models of the S-27 satellite, including two flight models. They are also providing the antennae modules for all the payloads.

The antenna system embodies exceptional novelty, for the 75-ft. aerial rods are certainly the longest yet developed for any satellite. To accommodate them, use has been made of a system devised for a War-time application by Mr. G. J. Klein of



D.H. Canada's antenna extension unit—complete module.

D.H. Canada's antenna extension unit—principle of tube development.



Type A.1 antenna extension unit developed by The de Havilland Aircraft of Canada's Special Products Division for the Canadian Topside Sounder Satellite S-27.

Canada's National Research Council. It comprises essentially a tubular antenna made of a tape of spring steel which has been so heat-treated that, when unrestrained, it springs into the form of a long tube.

For storage purposes in a satellite, this tube is opened flat and wound on a drum, in much the same way as a carpenter's steel measuring tape. Using this principle, de Havilland have produced a self-contained unit—including integral power supply—which, when retracted, is very compact and light in weight, yet sufficiently robust to meet the vibration and thrust loads incurred during launching. When extended, the tube provides a rigid antenna which lengthens out to 75 ft. and has adequate strength to withstand de-spin loads in orbit.

Each antenna unit, weighing only 9 lb., is a self-contained package, complete with its own power supply for extension of the antenna, automatic power cut-off at completion of extension and provision for manual rewind during ground test. As the power requirements for extension are small, it is possible by a simple change of the gear train to provide a choice in the rate of extension of the antenna tube. In general, this rate will be fairly slow, as the de-spin bending moment in the root of the antenna tube varies directly with the rate at which the tubes are extended.

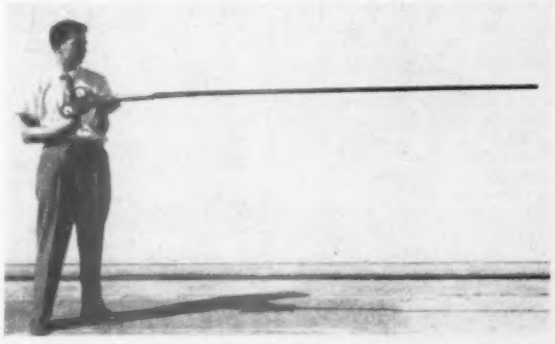
The antenna tape is made of spring steel or beryllium copper a few thousandths of an inch thick and is stored on the antenna drum with thin Mylar tape of equal width interwound with it. In this way, when the Mylar tape is wound on to its drum via a motor-driven gear train, the antenna material is pulled out through the glass-fibre sleeve as shown in the accompanying illustration.

As the antenna extends beyond the sleeve, it is in a tubular form which it retains as a result of its previous heat treatment. The two edges of the tape overlap by some 180° so that the tube has almost the strength of a seamless tube of the same diameter and wall thickness.

When the antenna is fully extended, so that the last turn is paid off the antenna storage drum, a hole in the drum is exposed, permitting a spring-loaded follower arm, which normally rides on the surface of the tape, to drop into a final position causing a cam to close a micro-switch which cuts off power to the drive motor. A mechanical stop is also provided so that the mechanical storage drum is mechanically locked in a fixed position in the event of failure of the micro-switch. The design provides an accurate length of antenna tube to within $\pm \frac{1}{2}$ in.

In order to rewind the antenna during ground checking, a manual rewind spline on the antenna storage drum is provided. As the storage drum is rotated, the follower arm first rides up on to the tape and then the Mylar and antenna material are rewound together on to the antenna storage drum. During the rewind operation, the drive motor is disconnected mechanically and electrically.

The rate of extension of the antenna tube in a spinning satellite—as mentioned earlier—is governed by considerations of bending moments due to de-spin. However, if this is not a requirement, a very fast extension rate can be achieved. It will be seen that the maximum length of the antenna tube is governed only by the amount of material stored on the antenna drum



A length of tubular antenna being "wound out" from the type A.1. extension unit.

(de Havilland consider it could be several hundred feet). The de-spin bending moment reaches its maximum value at a fairly early stage of the extension process, so that a subsequent increase in length does not increase the stresses in the tube.

Thus, the technique would be ideal in the case of the extremely long antenna which will be required by research satellites, such as the Nuffield Radio Astronomy Observatory, Jodrell Bank, have proposed, for extending radio-astronomical observations beyond the Earth's atmosphere.

In addition to The de Havilland Aircraft of Canada's effort other work for the S-27 satellite has been done by the Sinclair Radio Laboratories. Under the general direction of D.R.T.E., this company has undertaken all the design work on the sounder antennae, has analysed alternative types, and has designed the matching network. It is also studying antennae models and, as mentioned earlier, is responsible for the electrical design of the telemetry antennae.

Ground Stations

Design, construction and installation of ground telemetry stations in Canada are the responsibility of D.R.T.E. Stations are being established at Resolute Bay, N.W.T.; Prince Albert, Sask.; and Ottawa. A U.S. Minitrack station now being installed at St. John's, Newfoundland, will also take part in the experiment. The three stations for which D.R.T.E. is responsible will be telemetry receiving and recording stations but will not have satellite tracking capability as will the Minitrack station at St. John's.

Launching vehicle, launch facilities and satellite orbital tracking are all being provided by NASA. It is anticipated that launching will take place early next year from the Pacific Missile Range using a Thor-Agena B vehicle. Orbit, inclined at 80° to the equator, is expected to be nearly circular at a height of 600 to 700 miles. Details of the experiment itself, including transmitter frequencies, are given in the accompanying table.

S-27 TOPSIDE SOUNDER

Orbit :	
Inclination	80° to equator
Apogee and shape	600 to 700 miles, near circular
Mission :	
Sweep frequency ionospheric sounder..	2 Mc/s. to 12 Mc/s. in a 10 sec. sweep. Sounder transmitter pulsed for 100 microseconds, PRF 60 c/sec. Sounding time 600 sec. upon command from ground stations in Canada, England—Minitrack stations along the 75th meridian
Cosmic particles (including relativistic particles)	Instrumentation supplied by National Research Council of Canada
Telemetry :	
Power and frequency..	2 W., 136.08 Mc/s. wide band F.M. This link carries the sounder output and operates only during the sounding cycle
Beacon :	
Power and frequency..	250 mW., 136.59 Mc/s. This link carries low frequency data including data from the N.R.C. cosmic particle experiment. This transmitter operates continuously.

In addition to the Minitrack facility in Newfoundland, NASA will also provide ground telemetry and data recording facilities at a number of Minitrack stations throughout the World. These will include a string of stations along the 75th meridian, one at Winkfield, Berkshire (THE AEROPLANE AND ASTRONAUTICS, Jan. 27, 1961, p. 101) and probably one at Singapore, Malaya

Weightlessness and Liquid Hydrogen

A ROCKET launching to determine how liquid hydrogen behaves under conditions of weightlessness was made from the NASA launching facility at Wallops Island, Virginia, on Feb. 5. The experiment—the first of a series—was made with the Aerobee 150-A sounding rocket which is manufactured by the Aerojet-General Corporation. Test results will be applied in the development of both the Centaur and Saturn vehicles which employ liquid hydrogen as fuel in top stages; they will also be of interest in the nuclear rocket project Rover which uses liquid hydrogen as working fluid.

In this month's initial test, the Aerobee carried a 303-lb. payload consisting mainly of a partially filled Dewar bottle of liquid hydrogen and a recovery package. The rocket reached a maximum speed of about 3,600 m.p.h. and ascended 94 miles. Actually, this was somewhat lower than had been expected.

The test vehicle, which left the launching tower in a near-vertical trajectory, was in fact scheduled to reach a maximum speed of 5,600 ft./sec. and a zenith altitude of 118 miles. This would permit a five-minute period for the experiment under gravity-free conditions before the payload was separated by a timer, by means of a pyrotechnic charge, after 380 seconds of flight. Following separation, the package was designed to fall freely to approximately 30,000 ft., whereupon the parachute would deploy to effect recovery.

Experimental equipment within the nose-cone was arranged as follows: The bottle containing the liquid hydrogen was mounted on a spin-stabilized platform photographed continuously during flight. The bottle itself was instrumented to determine the heat transfer coefficients for liquid hydrogen in the absence of gravity. Liquid hydrogen has a density of about one-tenth that of kerosene or other hydrocarbon fuels; at sea level its boiling point is −423° F.

All experimental data other than photographic was telemetered to the ground. During the period when the rocket was weightless, it was essential that the liquid hydrogen remained in a motionless state. To avoid deceleration, which would cause the liquid hydrogen to move to the top of the bottle, residual rocket pressurization gas was fed to two nozzles supplied with gas from an oxidant tank.

Propellent shut-off valves were installed in both fuel and oxidizer feed lines. These valves could be closed by radio command to effect emergency propulsion cut-off in the event of erratic rocket performance.

Recovery equipment was supplied by the Cooper Development Division of the Marquard Corporation. Housed in the forward section of the nose-cone, it included the experiment camera, parachute, radar "window," Sarah beacon, flotation bag, and dye marker.

Unfortunately, in the launching of Feb. 5, heavy seas prevented the camera package from being recovered although it was seen floating in the ocean. But useful results were telemetered from the experiment during flight.

Re-entry Hypersonics

HIGH-SPEED re-entry problems associated with spaceflight are being studied by the General Electric Company in a special double-chamber shock-tunnel. The tunnel has, in fact, already produced some of the highest airspeeds yet recorded and is believed to be the first to provide two separate test chambers of high-speed air flow under identical conditions.

In conventional shock-tunnels, a limited number of measurements can be made during single tests but these have proved very difficult to duplicate later for further observation. The new tunnel permits many more measurements than were previously possible from a single test operation.

The shock-tube itself is basically a device for putting a large amount of energy into a quantity of gas. A mixture of hydrogen and oxygen diluted with helium is ignited, thereby producing a controlled explosion. This explosion ruptures a stainless steel diaphragm separating the burning mixture from low pressure air in the rest of the tube. The shock thus produced travels the length of the 100-ft. tube and rebounds from the far end where the air is momentarily compressed to high values of pressure and temperature. Two nozzles at the end of the tube allow the trapped air to expand and flow over small test models. Depending on the size and shape of the nozzle opening and the strength of the initial shock, the air speed over the models may be as high as Mach 35.

Many tests have been made at flows between Mach 20 and 25, and test speeds are now in the range of Mach 25 to 35. Such research is considered important primarily for space vehicles, since Mach 35 is approximately the speed needed to escape the Earth's gravitational field. Conversely, it is also near the speed which a vehicle would have if it returned directly into the Earth's atmosphere, without rocket braking, from a deep space mission.

Designers of the G.E. shock-tunnel believe it will eventually be possible to achieve air speeds as high as Mach 50. They also point out that, in addition to high velocity simulation, the tunnel can provide any desirable atmospheric condition. The shock-tunnel laboratory, for example, is now engaged in simulating the conditions which a spacecraft would encounter in entering the atmospheres of other planets, with particular reference to Venus and Mars.

The Vanguard in Service

IN the Vickers Vanguard, British European Airways believes it has the "finest piece of operating equipment for the airlines anywhere in the World." This is the considered opinion of the Corporation's professional engineers who have been concerned, since 1955, with the development of this aeroplane. In B.E.A.'s experience, no other aeroplane has been designed for the operator to the same degree as the Vanguard—a tribute, indeed, to the Vickers team's willingness to co-operate in meeting an airline's requirements. In the case of the Vanguard, there were, too, long years of Vickers/B.E.A. collaboration over the Viscount to provide a foundation of mutual understanding and respect.

The design history of the Vanguard was related in detail in THE AEROPLANE for Dec. 19, 1958, but it is worth recalling here that the project work which led eventually to the Vanguard was initiated largely to meet a B.E.A. requirement for an aeroplane to follow the Viscount, and started in 1952. By April, 1955, all the major design decisions had been made, and the B.E.A. order for 20 was confirmed in October the same year. Although B.E.A. was the principal sponsor of the design, Vickers had been influenced, too, by T.C.A. requirements for a similar aeroplane, but having more range and a bigger payload than B.E.A. had specified. The T.C.A. interest also crystallized, and became a firm order for 20 (later increased to 23) in January, 1957.

British European Airways' ideas about new aeroplanes are translated into written requirements by the Project and Development branch, one of the four units making up the Engineering Department. The linking of project and development responsibilities in single individuals throughout this branch is, the Corporation believes, most important, since it facilitates the feeding back to manufacturers of practical experience with flight equipment. In the case of the Vanguard, B.E.A. experience with the Viscount 800 exerted considerable influence on, for instance, the flexibility of interior layouts; seat rails, movable passenger service panels, detachable pantry and toilet units were all specified in the light of this experience.

Of some 200 engineers in the P. and D. branch, about half have been concerned with Vanguard development, including specialists in all aspects of the structure and systems, cabin furnishing, ground handling and so on, and from the time the contract was signed to mid-1960, over 150,000 man-hours had been employed on this aircraft. All this, as well as the tremendous effort put in by the Vickers engineering staff at Weybridge, has been significant in making the Vanguard so highly satisfactory from the engineering viewpoint.

In other respects, the Vanguard has fared less happily, especially in so far as its use by B.E.A. is concerned. When the requirement was first discussed, the Vanguard was being thought of as an across-the-board replacement aircraft for the

In the unmistakable black, red, white and silver livery of British European Airways, the Vickers Vanguard will go into regular service in Europe on Mar. 1. In the top picture, passengers are disembarking at Paris from one of the occasional services operated by Vanguard since mid-December.

whole B.E.A. Viscount fleet, suitable for operation on all flag routes. The significance of jet competition was not fully appreciated in 1952 and, even at the time of the Vanguard contract, was not considered to be anything like as important as it is known to be today. Thus, the order for 20 appeared to Vickers to be just the first instalment of an eventual requirement for a much greater number.

This situation was changed first by the introduction of big jets on some European routes by B.E.A.'s competitors, who had purchased this type of equipment for their long-haul routes, and then by the development of short-haul jets purchased specifically for European operations. B.E.A. conducted a study which showed that the drawing power of the jets was more than sufficient to compensate for 20% higher seat-mile costs. The purchase of Comet 4Bs by B.E.A. followed logically, depriving the Vanguard, as it were, of its earlier expectation of life, and the advent of newer double-flow engines has made the short-haul jet, as exemplified by the D.H. Trident, look still more attractive.

However, there remain a number of opportunities for very full exploitation of the Vanguard by B.E.A., and no effort will be spared by the Corporation to achieve maximum utilization of the fleet of 20. Fully scheduled services begin on Mar. 1, using the first six Vanguards, which are 951s. Delivery of the remaining 14 in the 953 version will be completed by the end of the year and a utilization rate of about 2,300 hours a year is, in fact, expected to be achieved by the summer of 1962.

According to plans so far announced, the Vanguard will take over from Mar. 1 a large part of the London-Paris services, including those which the Corporation is to fly from and to Gatwick. On Apr. 1 it will be put on to the London-Madrid services and will also appear for the first time on a domestic trunk route—that to Glasgow. On Jne. 1, the longest Vanguard service will begin, to Malta via Naples and Rome; on Jly. 1 it will begin serving Belfast; and on Aug. 1 Milan and Edinburgh will be added to the Vanguard network.

Next year, the Vanguard will begin service to Gibraltar, Milan, Nice and Dusseldorf, and in 1963 will probably go to Dublin, Barcelona, Palma and Basle also. It will not necessarily be providing all the capacity to all these points, but in some cases will be sharing the traffic with Viscounts and Comets.

There are several other possibilities for the future deployment of the aircraft, such as night tourist services to Scandinavia, short cross-Channel routes to destinations such as Brussels and Amsterdam, and other domestic routes including London-Manchester and London-Birmingham. It will be seen from these plans that B.E.A. is avoiding direct competition between the Vanguard and jet aircraft, except over very short ranges (e.g., to Paris, Brussels and Amsterdam) where the jet's time advantage is of negligible importance and traffic is heavy anyway.

It is sometimes suggested that the Corporation is in any case protected on routes such as these by its pool agreements with the other national carriers on them. However, it is not true that pool agreements completely eliminate competition or reduce the need for competitive equipment. Very few pools divide revenues equally between the two partners, and each agreement is usually revised annually. Thus, if either partner seriously loses ground as a result of using uncompetitive equipment or for any other reason, he is likely to be forced to accept a smaller share of the revenues when the agreement is next revised.

Domestic Operations

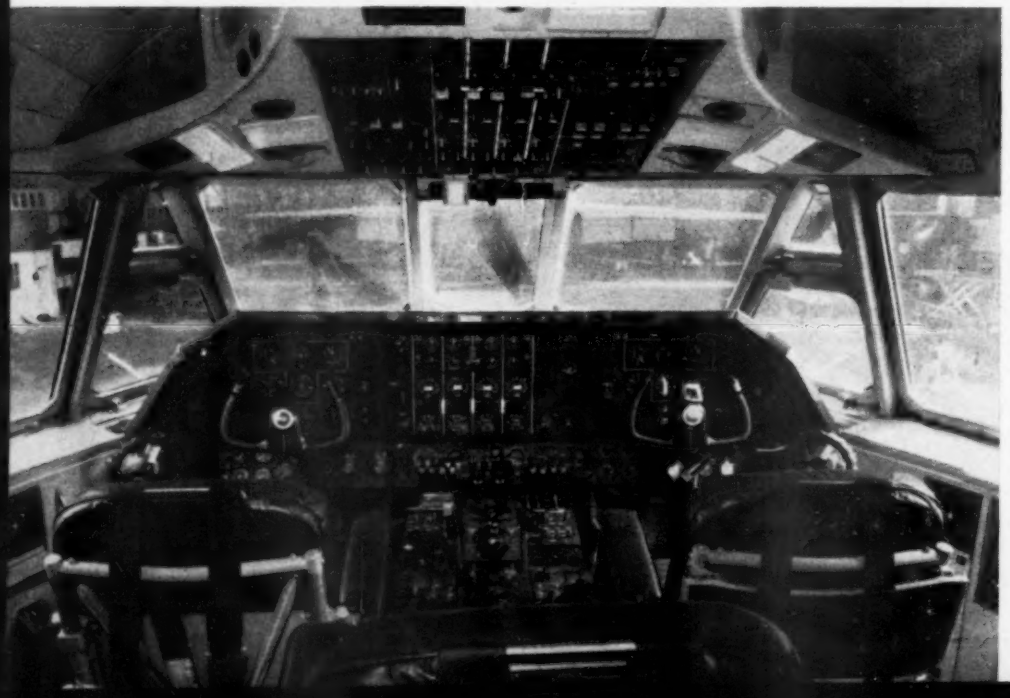
Actually, the Vanguard has arrived at a particularly opportune moment for use on the domestic trunk routes. As is well known, B.E.A. achieved something of a break-through on these routes in 1960, and is now committed to a 40% increase in capacity to be offered on them in 1961. With its large capacity and flexible interior layout the Vanguard is going to be a very good aeroplane indeed for these services.

For most of the international operations, and some domestic, the B.E.A. Vanguard has a standard layout seating 96 economy-class (six-abreast) and 18 first-class (four-abreast) passengers. This represents, at 100% load factor, virtually the entire payload (limited by landing weight) of the Vanguard 951s, which are of the original Vanguard Mk. 1 type having a gross weight of 135,000 lb. As these aircraft are to be used, initially at least, on routes where very high passenger load factors are common, comparatively little fill-up freight is likely to be carried.

This situation has arisen, in part at least, because of a fundamental change in B.E.A. policy which originally intended to limit the seating to five-abreast "high-standard tourist." This would have given a maximum of 96 seats tourist throughout, or fewer in mixed class, and would have allowed at least a little freight to be carried on virtually every flight. Policy subsequently changed to allow six-abreast tourist seating and to give greater emphasis to mixed-class operations in view of the sustained demand for a proportion of first-class accommodation. An increase in maximum payload in the Vanguard 951 from 21,000 lb. to 23,500 lb. allowed B.E.A. to make this change. In due course, the six Vanguard Is will probably be employed on domestic and night tourist services on which there is in any case little requirement to carry freight.

The 14 Vanguard 953s which complete the B.E.A. fleet are of the Mk. II standard, with gross weight increased to a maximum permissible 146,500 lb. and payload boosted to 37,000 lb. The modifications to achieve these new weights and the associated higher landing and zero-fuel weights are a major structural strengthening scheme in the wing centre-section and fuselage frames, and were designed too late for inclusion in the first six aircraft on the line. The increased payload makes it

(Above) Part of the tourist-class cabin in the B.E.A. Vanguard, showing the six-abreast seating which, as related in the text, was adopted at a late stage in the Vanguard's development to take advantage of increased payload.



The B.E.A. Vanguards will normally be operated by a three-pilot crew, but five seats are provided on the roomy flight deck, including a rest seat behind the Captain and a jump seat behind the co-pilot.

Trans Canada Air Lines put the Vanguard into service on Feb. 1 on routes across Canada. The enormous freight capacity of the aircraft is indicated in the picture below, of 1,360 cu. ft. of freight as it would appear before being loaded.

possible to fly the Vanguard in a very high density version—six-abreast seating throughout and a total of 138 passengers—or in the standard B.E.A. 114-seat mixed class layout with a 4,500 kg. (9,920 lb.) dead load of freight. The freight which can be carried is limited volumetrically rather than by weight, and this dead load figure assumes an average freight density of 6 kg./cu. ft. (13 lb./cu. ft.) and no pallets. The use of pallets of the type at present being studied would reduce the dead load by about 2,700 kg. (5,950 lb.), again because of the space taken up by the pallets rather than their weight.

One of the problems B.E.A. has still to resolve is the proportion of first-to-economy class seats to be used on domestic trunk peak services. Morning and evening services between London and Glasgow, Edinburgh and Belfast are well patronized by businessmen, most of whom travel first class. For these services, about half the total accommodation may be offered as first class (the total may be limited by the space available for catering services) and B.E.A. is looking into the possibility of retaining the tourist-class triple-seat units at the same pitch, but removing the armrests and selling only two positions in each.

Utilization of the Vanguard for most of this year will be limited by the need to devote some aircraft to crew training, and by the lack of engine hours—the overhaul period of the Tyne 506 is at present restricted, but is expected to increase to 1,000 hours by the middle of 1962. Both the crew training situation and shortage of engine hours are attributable to the eight-month delay in Vanguard deliveries which followed the grounding of the Tyne on May 23, 1960.

Failure of a Tyne turbine disc on a test-bed, only a few days before the C. of A. was to be granted to the Vanguard, revealed an obscure metallurgical fault which required all turbine discs to be replaced. Vanguard test flying with short-life engines was resumed on Jly. 4, but a set of modified engines did not become available until Oct. 6, when a 200-hour programme began in G-APED, the fourth B.E.A. Vanguard. Successful completion of this programme led to certification of both the B.E.A. Vanguard 951 and T.C.A. Vanguard 952 on Dec. 2. The Vanguard was the first aircraft certificated

from the outset to the 1959 British Civil Airworthiness Requirements and the certificated take-off and landing distances were of the order of 1,000 ft. better than Vickers' guarantees.

The first fare-paying passengers were carried in the Vanguard on Dec. 17, between London and Paris, and since that date Vanguards have been used in place of Viscounts on some services on an *ad hoc* basis, as training commitments allowed. All B.E.A. crew training has been based at Stansted, although a number of captains received instruction at Wisley prior to deliveries being made. Capt. A. S. Johnson, as Vanguard Flight Manager, has had an office at Wisley since 1958, and has been closely concerned with the flight development of the aircraft.

The T.C.A. Version

Trans Canada Air Lines took delivery of its first Vanguard 952 on Dec. 8 last year, and three more had reached Montreal by Feb. 1, the date on which the 952s went into service. The T.C.A. model is the first Vanguard II cleared to operate at the higher (146,500 lb.) all-up weight and with a 33,500 lb. payload which, as related above, was originally achieved to meet T.C.A. requirements and was later adopted by B.E.A. T.C.A. will be operating Vanguards over much longer stages than B.E.A. (Toronto-Nassau, for instance, is a 1,500-st.-mile stage) and will often be operating at the maximum take-off weight, whereas B.E.A. will seldom need to use more than 140,000 lb., even with a full payload.

This also explains the difference in powerplant between the Vanguards of the two operators. B.E.A. originally specified the Tyne R.Ty.1 (Mk. 506) and has decided to keep these engines in the Vanguard 953s (which are therefore not true Mk. IIs). T.C.A., operating at generally higher gross weights, has the Tyne R.Ty.11 (Mk. 512) engines, which give higher cruising speeds and better economies, particularly on the longer sections.

Reactions to the Vanguard in Canada to date have been extremely favourable. After the first had arrived, Mr. G. R. McGregor, T.C.A.'s president, said: "The lower unit operating costs anticipated from the Vanguard were a basic factor in the calculation of the new fare structure. T.C.A.'s highly satisfactory experience with the Viscount gives promise that its larger turboprop stablemate, the Vanguard, will have an equally favourable impact upon air transport economics." B.E.A. estimate that the direct operating costs of the high-density Vanguard will be approximately 2.5d./seat mile over 200 statute miles and 1.8d./seat mile over 500 statute miles.—F.G.S.

Vanguard in Service . . .

Engineering Features of the Vanguard

ENTERING regular airline service nearly eight years after the Viscount, the Vickers Vanguard is the only true second-generation turboprop airliner in the World. Designed for B.E.A. and T.C.A. as a Viscount replacement, the Vanguard relies heavily on experience with its predecessor.

Instead of incorporating in its design novel but unproven engineering techniques which might offer theoretical advantages, Vickers wisely decided to base Vanguard design on Viscount practice. Only those features have been altered which experience or later requirements have shown to be necessary and desirable.

One of the main differences which distinguishes the Vanguard from a scaled-up Viscount is its two-deck double-bubble fuselage. Passengers are carried only on the upper deck; the whole of the lower deck is taken up by freight holds with a total capacity of 1,360 cu. ft. This makes it possible to take advantage of the large payload by carrrying freight even with a full load of passengers. The advantages of this far outweigh the penalties involved, which are 1,000 lb. in structure weight and 5 m.p.h. in cruise speed.

Airframe

Structurally the Vanguard is of conventional design. The emphasis has been on ensuring a long fatigue life for the airframe which, from a fatigue viewpoint, will be subjected to punishing treatment by short-haul operations with their high ratio of take-offs and landings to total flying hours.

To ensure a good fatigue life, stress levels in the structure have been kept low; the maximum in the fuselage is 11,000 lb./sq. in. Fail-safe features and multiple load paths are a feature of the design.

The fuselage has closely spaced frames of channel section supporting Z-section stringers to which the skin panels are flush riveted. The frames are cleated to the skin throughout.

Cut-outs have received special attention. Door surrounds are constructed from machined frames with extensive skin doubling plates to provide an alternative load path.

Elliptical cabin windows are used, as on the Viscount. Another feature of the 800-series Viscount which has been retained is its parallel link motion cabin doors.

The main wing structure is built in five sections and consists of a torsion box stretching from tip to tip. The box has three shear webs and light-alloy panels with integrally machined stringers which form the upper and lower surfaces. Fail-safe design of the structure ensures that adequate strength and stiffness are retained even if there is major damage to any one of the shear webs or any one skin-stringer panel.

A similar type of structure is used for the tailplane and fin. In these cases, however, the surface panels are of aluminium-alloy sheet with riveted stringers.

All units of the Vickers-designed undercarriage have twin wheels with low-pressure tyres. Undercarriage units retract forwards and fall freely for emergency lowering. Dunlop wheels, tyres and brakes are used. Power steering is used to rotate the nosewheel through ±70°; beyond this range the steering is cut off. For towing the nosewheel can be turned through 360° without disconnecting the torsion links.

Powerplant

The Vanguard is powered by four Rolls-Royce Tyne engines. This second-generation turboprop stands in the same relation to the Vanguard as the Dart does to the Viscount. Both engines were designed from the start for airline operation and neither has had military experience before entering airline service. The Tyne is unique as the only advanced turboprop of its size in the Western World.

This two-spool turboprop has a pressure ratio of 13.67 : 1 and a mass flow of 46.6 lb./sec. It has a six-stage LP compressor driven by a three-stage LP turbine and a mechanically independent nine-stage HP compressor driven by a single-stage HP turbine which incorporates air-cooled blades.

Two versions of the Tyne power Vanguards; B.E.A. aircraft have the RTy.1, with a minimum take-off power of 4,785 e.h.p., and T.C.A. Vanguards are powered by the 5,325 e.h.p. RTy.11. At take-off power their respective specific fuel consumptions are 0.505 and 0.482 lb./lb./hr.; both versions have the same basic dry weight, 2,275 lb. Average take-off power of the RTy.1 is 4,985 e.h.p.

The Tyne power units of the Vanguard are all interchangeable. They have petal cowlings similar to those of the Viscount and their attachment at the firewall by four tubular mounts is similar to the system used on the earlier aircraft. Engines are mounted with jetpipes passing over the wing to ensure good ground clearances for the propellers; these are a minimum of 30 in. inboard and 45 in. outboard. This arrangement also ensures good access to the underfloor freight compartments without prejudicing the maintenance advantages given by the low mid-wing arrangement.

Simple direct throttle and propeller control interconnection as used on the Viscount is retained for the Tyne. One lever provides throttle and engine-speed control and a second lever is for mechanical trimming of the fuel flow, operation of the high-pressure fuel shut-off cock and for feathering. Beta control of propeller pitch for ground manœuvring has been incorporated in the throttle linkage.

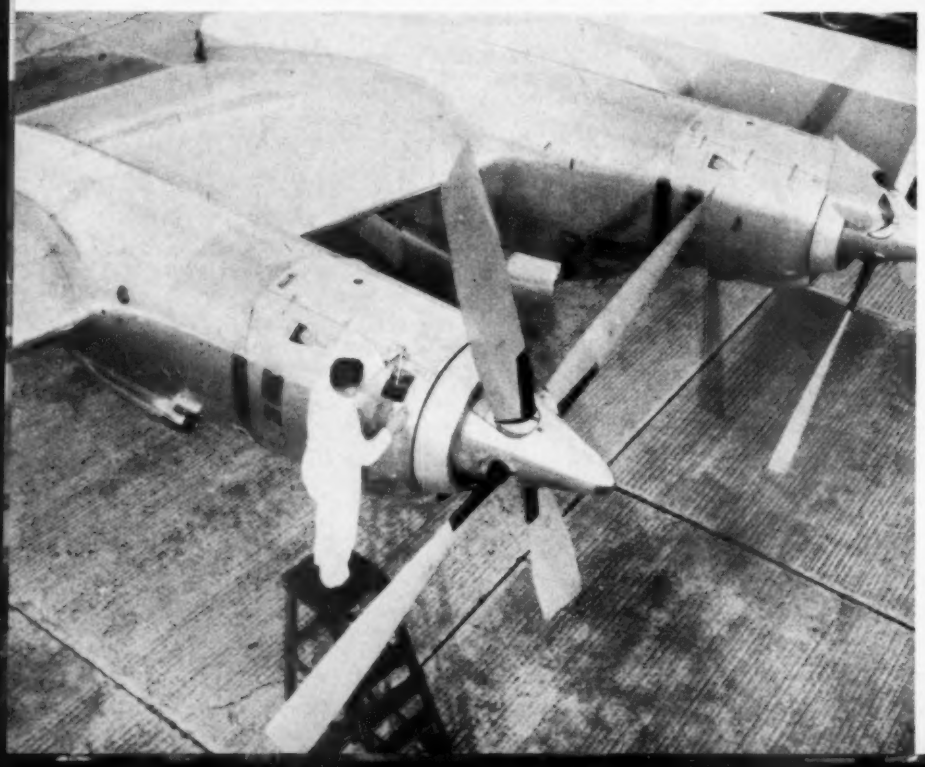
Propellers

Four-bladed de Havilland propellers of 14 ft. 6 in. diameter are used. Features of the propeller are constant-speed operation; provision for automatic feathering; manual pitch (Beta) control for ground handling; reverse-pitch operation; and a comprehensive range of safety devices. Synchrophasing and electric de-icing are also standard features of these propellers.

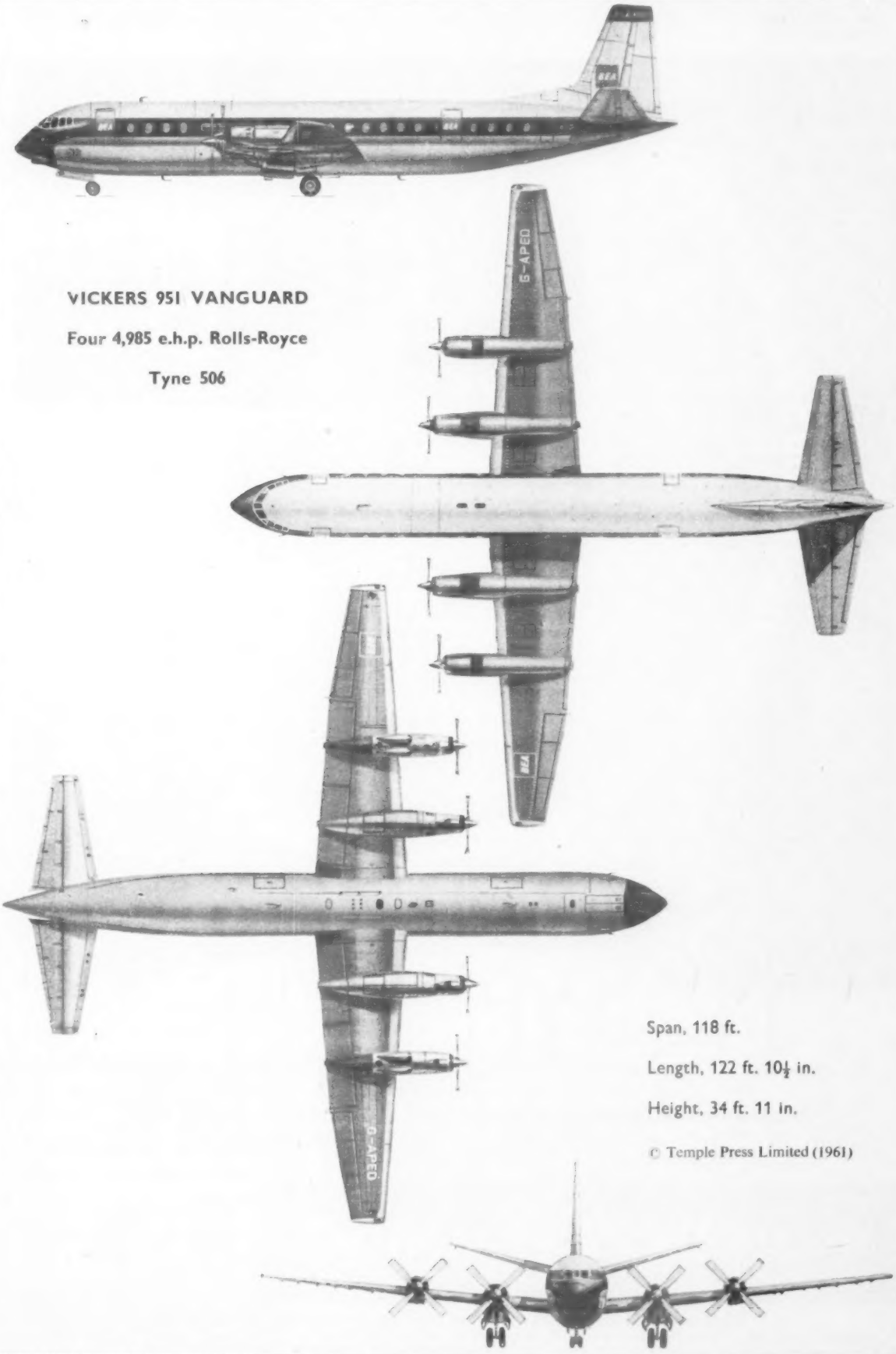
Systems and Services

Airframe systems of the Vanguard are broadly similar to those of the Viscount, except that its flaps are hydraulically operated. Systems design has been

(*Continued on page 210*)



POWERPLANT—Oil level is checked on one of the Vanguard's Tyne turboprops. The aircraft's de Havilland propellers have conical spinners to ensure good intake efficiency at the Vanguard's high cruising speed.



VICKERS 951 VANGUARD

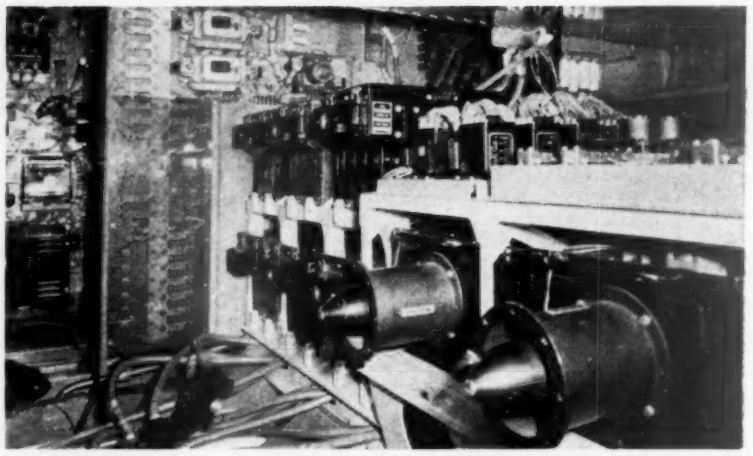
Four 4,985 e.h.p. Rolls-Royce Tyne 506

Span, 118 ft.

Length, 122 ft. 10½ in.

Height, 34 ft. 11 in.

© Temple Press Limited (1961)



ELECTRICS BAY.—Two of the Vanguard's four silicon transformer-rectifier units and its six 24-volt batteries can be seen in this view looking forward inside the fuselage electrics bay.

(*Continued from page 208*)

considerably influenced by the need to minimize turn-round time, ground handling and maintenance. For this reason most components of the electric, hydraulic and air-conditioning systems are grouped in bays accessible from beneath the fuselage by men standing on the ground.

Fuel is stowed in four integral wing tanks; total capacity is 5,100 Imp. gallons. No fuel is carried in the wing centre-section. Tanks can be pressure refuelled at the rate of 600 gallons a minute from a single point in the port wing root.

Engine and flying controls are manually operated by push-pull rods mounted on swinging links to minimize friction. Control surfaces have spring tabs and setback hinge balances; manual trimming is also provided. The constant-chord Fowler flaps are in four sections on each wing. They are operated by a simple hydraulic screw jack in the inner wing which drives a torque shaft and moves the flaps via a cable system.

A Normalair pressurization and air-conditioning system is used. With the exception of the nose radar bay, nosewheel bay and fuselage tail, the complete fuselage is pressurized to a maximum differential of 6.5 p.s.i. Compressed air is provided by two Godfrey cabin blowers mounted on the inboard engine accessory gearboxes. Full pressure can be maintained by either blower.

The air-conditioning bay is located around the nosewheel compartment. Air is fed from it directly to the cabin at roof level and at slightly below luggage-rack level and partly behind the sidewall furnishing trim to provide radiated heat. A complete change of cabin air occurs every three minutes. Kidde emergency oxygen equipment is installed.

Hot air de-icing is used for the wing; the air being obtained from engine exhaust heat exchangers in the outer nacelles. Tailplane and fin leading-edges have Napier Spraymat surfaces for cyclic electrical de-icing.

The hydraulic system operates the flaps, undercarriage, nosewheel steering, wheel brakes, propeller brakes and passenger steps. It is a conventional 3,000-p.s.i. constant-delivery engine-driven-pump system with one pump on each engine.

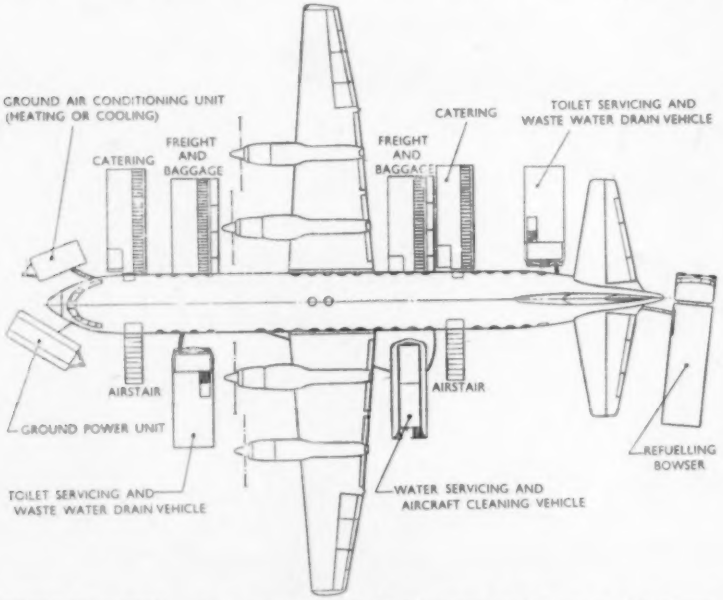
An electrically driven auxiliary pump tops up the main system when the engines are not running, and provides power for ground handling and emergency flap operation. The hydraulic tank and most of the control valves and accumulators are in a sealed hydraulic compartment just behind the wing torsion box.

The Vanguard has a 28-volt DC electrical system. The Rotol engine accessory gearboxes drive six Rotax variable-frequency AC alternators, each with a fully rated output of 50 kVA at 200 volts. Two alternators are driven by each outer engine and one by each inner engine.

Four alternators, one on each engine, are coupled to Ferranti transformer-rectifier units, each with an output of 500 amps. at 28 volts. The alternators also supply power for de-icing to their respective propeller, spinner and intake.

The remaining alternators on the outer engines supply power for Spraymat de-icing of the tail unit and for demisting and de-icing of windscreens, for which a Triplex gold-film system is used. Only one alternator supplies these loads, which can be transferred between the two alternators by manual switching.

Batteries, transformer-rectifier units and other major items of the system are concentrated in an electrics bay ahead of the wing centre-section; the electrics bay is well away from hydraulic equipment. It can be reached easily from beneath the fuselage or, in emergency, via a removable hatch in the cabin floor.



GROUND ACCESS.—Turn-round time of the Vanguard can be cut to a minimum because a wide range of ground servicing equipment can be brought up to the aircraft simultaneously.

VICKERS VANGUARD 951*

Dimensions
Span: 118 ft.
Overall length: 122 ft. 10½ in.
Overall height: 34 ft. 11 in.
Gross wing area: 1,529 sq. ft.
Internal cabin dimensions (ex. flight deck):
Length: 90 ft.
Max. width: 82.5 in.
Max. height: 128.8 in.
Floor area: 893 sq. ft.
Usable volume: 5,690 cu. ft.

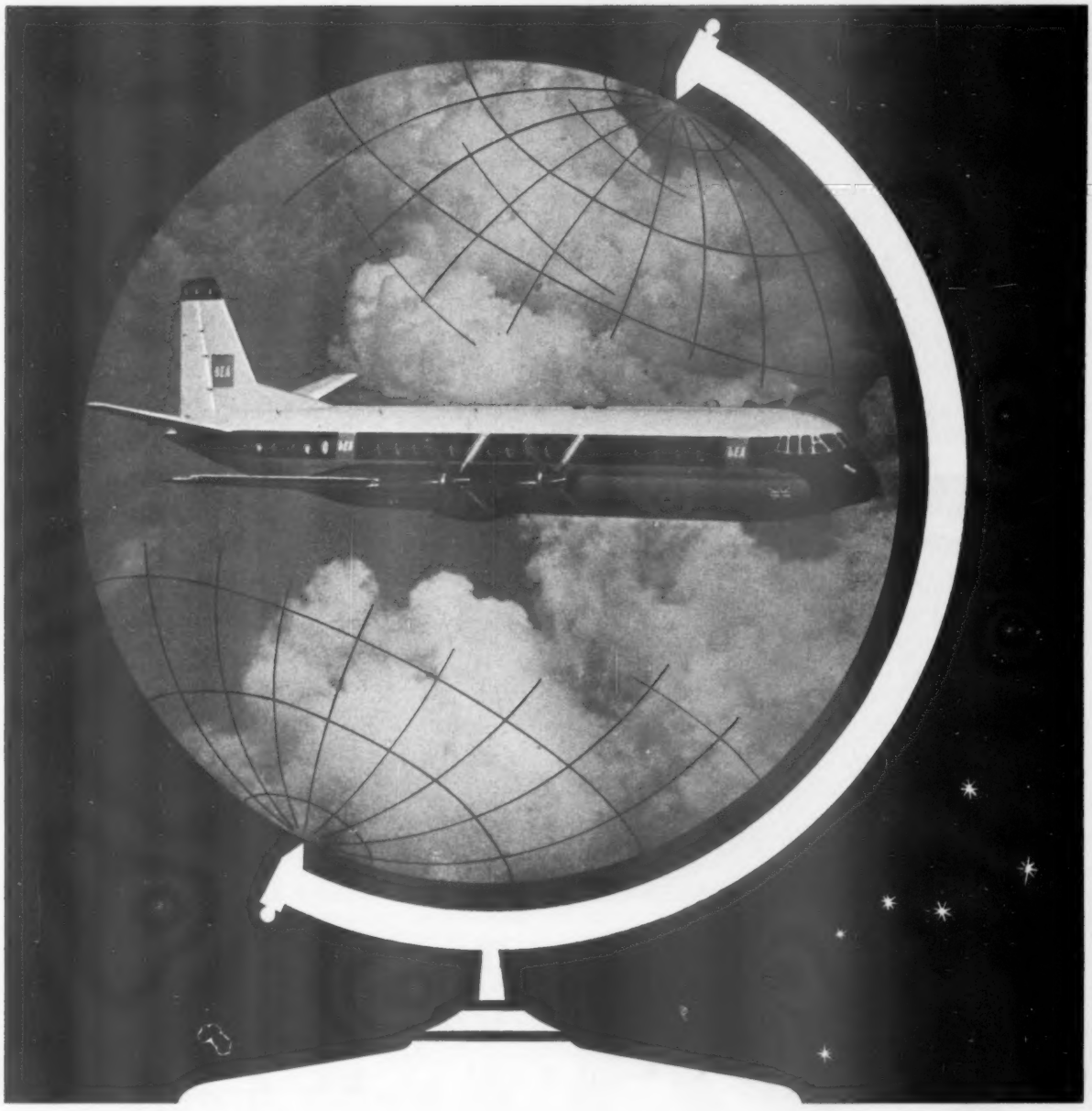
Accommodation
Typical mixed class: 114 (96/18).
Max. coach: 139.
Total freight hold volume: 1,360 cu. ft.

Powerplant
Four Rolls-Royce Tyne RTy. 1 Mk. 506 turboprops.
Take-off power each (I.S.A., s.l.): 4,985 e.h.p.

Weights and Loadings
Basic operational: 84,000 lb.
Total fuel: 41,040 lb.
Mfr's. max payload: 23,500 lb.
Max. take-off: 135,000 lb.
Max. landing: 116,500 lb.
Max. zero-fuel weight: 107,500 lb.
Wing loading (max. t.-o. wt.): 88.2 lb./sq. ft.
Wing loading (max. landing wt.): 76.2 lb./sq. ft.
Power loading (max. t.-o. wt.): 6.78 lb./e.h.p.

Performance
Take-off field length required: 5,200 ft. at I.S.A., s.l., and 135,000 lb. A.U.W.
Range with max. payload and full B.E.A. reserves and allowances: 1,550 stat. miles cruising at 330 kt. at 21,000 ft.
Landing distance required: 5,120 ft. at max. landing weight.

* First six B.E.A. aircraft are of this type; remainder are Vanguard 953s with gross take-off weight of 146,500 lb.; max. landing weight, 130,500 lb.; max. zero-fuel weight, 122,500 lb.; max. payload 37,000 lb.; and basic operational weight, 85,500 lb.



VANGUARD BY VICKERS

Wing de-icing heat exchanger. Heat insulation of jet pipes. Oil coolers . . .

by **Delaney Gallay LTD**

SPECIALISTS IN HEAT EXCHANGE AND HEAT INSULATION FOR OVER 40 YEARS

DELANEY GALLAY LIMITED, VULCAN WORKS, EDGWARE RD., LONDON, N.W.2. TELEPHONE GLAdstone 2201

TCA

first with Vickers Vanguard in North America

TCA — first airline in North America to operate the now world-famous Viscount. And first again — with the new Vickers Vanguard, now in service. 23 of these fast, 96-passenger airliners are on order — last stage in the huge TCA re-equipment programme. When it is completed, by the end of this year, TCA will be one of the first major international airlines to operate an all turbine-powered fleet.

Rolls-Royce DC-8's for inter-continental and major transcontinental routes. Viscounts for the shorter hauls. And now—Vanguards for medium-stage services. Soon TCA Vanguards will be in service all over Canada. And this is the aircraft that will be carrying the TCA colours to the USA, to Tampa (Florida), Bermuda, Nassau and the West Indies. For the finest equipment, fly TCA — one of the world's great airlines.

TRANS-CANADA AIR LINES TCA **AIR CANADA**

27 PALL MALL, LONDON, S.W.1. WHITEHALL 0851 AND OFFICES IN GLASGOW, SHANNON, BIRMINGHAM AND MANCHESTER

British Executive Operators

2 The Automobile Association

UNLIKE most of the articles in this series, which will set out mainly to show the value of privately or company-owned aircraft to British industries in expanding their sales horizons, a slightly more varied application is described this week, covering executive flying, air freighting, photo survey and traffic control. All these tasks, plus many others, are the frequent lot of the single aircraft operated by the Automobile Association on behalf of its 2½ million members. Unlike the more usual executive operations, they are undertaken by pilots who fly in addition to their normal full-time jobs within the organization, and by a fabric-covered biplane rather far removed from the sleek aircraft normally encountered in the corporate field.

Despite its advancing years, the D.H. Rapide of the A.A has at the moment no rival as a practical replacement, and it will continue for some considerable time to serve as an invaluable adjunct to the Association's very large fleet of other vehicles. The insistence throughout this series is in emphasizing the place of the aeroplane alongside all other types of company transport for the extension and fulfilment of business. And in establishing this, the A.A. has certainly qualified its inclusion among the purveyors of more tangible sales.

What the A.A. sells is service, and the vast size of its membership demands the most efficient means of securing this. Its aviation background, in any case, is very strong. It would not even be an exaggeration to say that the A.A. was mainly responsible for the establishment of private flying as a practical proposition in this country.

As long ago as 1909, only four years after its foundation, the A.A. added " Aerial Association " to its full title, and 20 years later, its Aviation Section was founded to provide the first flying maps and route advice for this country and all over the World. Airfield schedules, a meteorological broadcasting station at Heston, and many other services for the private pilot were made available by the A.A. until the outbreak of World War II, when the Aviation Section was handed over with its equipment en bloc to the Air Ministry. Most of the famous record-breaking pilots of the 'thirties had made use of its facilities.

The Association also had a couple of its own aircraft, including the well-known Gipsy Moth, G-AAAA, and these were used for some of the first large-scale experiments in traffic observation and control. The original attempts at aerial traffic survey dated from the 1921 Derby, when A.A. officials used, inter alia, the airship R.33, with results which still form the basic system for such regulation at most major outdoor events today. Pre-War efforts at traffic air survey, however, were inevitably frustrated by the lack of facilities for communication with ground patrols.

After 1945, as the A.A.'s radio network began to take shape in the regional offices at some 30 of the big towns throughout the U.K., aircraft experiments were continued with the help of chartered machines. In 1954, a helicopter was used with some success for observation of traffic and car parking problems during the Wimbledon Lawn Tennis championships. After further success with chartered Consuls during Easter, 1956, the A.A. bought its first post-War aeroplane, on a trials basis, in August of that year.

The four-seat Auster Alpine, G-APAA, was fitted with a full panel and a Murphy VHF radio, and also carried two Pye single-channel VHF sets for contact with mobile A.A. vehicles and regional headquarters. One of the reasons for purchasing an aircraft was to expand and maintain the radio network, in an emegrency, and this has been achieved by using the machine as an airborne relay when a ground station has been put out of action. From 2,000 ft. over the Midlands area, it is possible to hear and to speak to most of the A.A. ground organization throughout Britain.

Based at Fair Oaks, and equipped for aerial photography in addition to its other duties, the Alpine was used for about 18 months, and provided convincing proof of the value to the A.A. of its own aeroplane. For executive flights, however, its equipment reduced its useful load to one or two passengers, and it was not, of course, suitable for all-weather operation. Attempts were made to lay down a landing strip at the A.A.'s patrol training school at Widmerpool, Notts, where the commuting demand was fairly constant, but there was insufficient room even for an Auster, and the Shipside airfield of Tollerton was therefore used.

A replacement problem soon confronted the A.A. pilots, whose chief is Don Whitehead, assisted by Bill Lewis. Both were former war-time R.A.F. pilots of considerable experience, who had continued flying in the Volunteer Reserve while employed by the A.A.

As Assistant Transport Manager and a qualified engineer,

Above, the A.A.'s yellow and black Rapide is seen patrolling over the twin ribbons of Britain's first motorway—the M1. Right, one of the first jobs undertaken by G-AHKV and its two pilots, Don Whitehead (centre) and Bill Lewis (right) was to fly emergency food packs to snow-bound Scotland.

Don Whitehead is able to continue his ground job on arrival during executive flights, although such high productivity means a great deal of hard work. "Self-drive" executive flying is practical when an extensive flying background is already possessed by the businessman-pilot, and when the aircraft utilization is at the relatively low A.A. figure of about 300 hr. per annum.

To achieve the necessarily low operating costs with such a utilization, while having a six-seat passenger capacity, plus payload to spare for at least eight radio installations, and a permanently installed survey camera, the A.A. pilots concluded that only the venerable D.H. Rapide would meet their needs. It was the only twin of its size using a mere 20 gal./hr. of fuel, which is a most important point during traffic control, when petrol is being consumed simply to stay in the air, and not to get anywhere. It also provided incomparable visibility from cockpit and cabin, for the normal crew of pilot and radio observer, while offering accommodation for A.A. and police representatives with local knowledge in remote areas.

Two engines were considered essential for all-weather operation and for prolonged flying at relatively low altitudes over built-up areas. At the same time, the operating costs were still in the light aeroplane class, as will be seen by the tabulated figures, depreciation being virtually negligible for something like the Rapide. The A.A. aircraft, G-AHKV, is in fact considerably younger than most of its companion biplanes, having been built as recently as 1946, and having an unusually low-houred airframe when bought from Ind Coope in November, 1957.

The decision to purchase the Rapide followed a trial trip to Exeter with several of the A.A. executives, including the Secretary-General, Mr. K. L. Kelly. Its first operational trip came early in 1958 when it was used to carry emergency food packs, carried by Highland patrols, from Edinburgh to Dyce, for areas cut off by heavy snow. The Rapide was the first aircraft to land at Dyce for a week, and a snowplough was still clearing the runway as it arrived. Don Whitehead was a little worried that the Rapide's trouser-fairings would jam with snow on landing, but no trouble was encountered, and the Rapide was flown for about a week with local authorities, investigating blocked roads and finding stranded motorists.

Because of the close liaison needed with ground patrols and the dual-job requirement, it is considered that pilots for A.A. flying are more easily obtained from the Association's ranks than trained from commercially qualified flying personnel. On the other hand, a high degree of flying skill is needed for many of the operations in remote areas and marginal weather. When Cardiff was flooded late last year, and the A.A. radio was put out of action, the Rapide flew to the area in heavy rain, and maintained contact with the network through Bristol while circling over S. Wales.

Its equipment includes a 44-channel STC-12Z VHF, with a 34-channel Murphy stand-by, Bendix ADF and MF receivers, marker receivers, Marconi ILS, and the two Pye 2½-watt transmitter/receivers to maintain two-way communication with fixed stations within 100 miles, or with breakdown vehicles or motorcycle patrols within 20-25 miles. The Rapide's busiest time is during the summer, particularly at week-ends, when reconnaissance of traffic blocks and information relayed to ground control centres helps re-routeing and overall direction.

Borough surveyors are regularly flown with officials from the A.A. Highways or Routes Department, when particular problems present themselves during town planning or when large-scale diversions or temporary signposting schemes are necessary. The many special diversions necessary when the M1 was cutting through the countryside and across existing roads gave the Rapide a great deal of work to do. In many cases, vertical photographs are required of bottlenecks or road centres in town planning, and of road projects for the A.A. mapping section.

By repositioning the battery and inverter, there is room for a permanently mounted F.24 camera in the belly of the Rapide. It is remotely controlled from the cockpit for single photographs or overlapping mosaics, and a drift sight in the cockpit is used to line-up on the required area.

Photographs are often taken en route during executive or positioning flights, in addition to special survey sorties. The use of the Rapide in this way is considerably cheaper than using commercial services or Ordnance Survey facilities.

Achieved Operating Costs, D.H. Rapide (300 hr.p.a.)

Maintenance, £1 an hour	£300
Engine overhaul (one-third of 1,000 hr.)	£160
Fuel, 20 g.p.h. at 3s. per gallon	£1,500
Oil	£180
Insurance	£268
Hangarage, £15 per month	£180
C. of A. overhaul, average	£400
Landing fees, average, at £1 16s. per landing	£400
Total annual costs, excluding pilot salary and depreciation	£3,388
Cost per flying hour	£11.3
Cost per aircraft mile, shillings	1.88
Cost per seat mile (6 seats), pence	3.14

Most executive flights are to the more inaccessible offices such as those in Dublin, Belfast, Jersey, etc. For such short-range flights, the Rapide's cruising speed of 120 m.p.h. or so, is quite acceptable, as is its safe endurance of 3¼ hr.

An early example of its usefulness to the A.A. was a trip to the port offices in Ostend, Calais and Le Touquet to test possibilities of putting them in the radio network, with a portable transmitter. With the Rapide, the entire job was done in one day, and the party returned to the U.K. that evening; it is interesting to speculate how long surface transport would have required.

The seats in the Rapide, which also has a fold-down plotting table in the cabin, are quickly removable, leaving an excellent freight capacity. A typical freighting job was the transport of a number of glass-fibre sidecars for A.A. motorcycles in the Irish Republic. After getting commercial estimates for lifting these light but space-consuming articles across the Irish Sea, it was decided to fly them in the Rapide, which accommodated seven at a time, plus the leg and front shields, weighing about 110 lb. per unit. Three trips saw the first batch across, and after delivering them, Don Whitehead put on his transport manager's hat to check their installation on the motorcycles.

Urgently needed vehicle spares also form part of the Rapide's load, but the aircraft itself has been remarkably free from unserviceability. Despite the age of its design (or perhaps because of it), there have only been two occasions during three years when the A.A. Rapide has been delayed from starting a flight because of a snag. The first arose from a filter-casting leak, which was changed in a half-hour, while the second resulted from a tyre-burst during taxi-ing.

Having fixed-pitch airscrews and a fixed undercarriage, with no complicated systems, the Rapide is perhaps the only aircraft of its size which will keep itself serviceable during relatively long periods of inactivity, and can simply be pushed out of the hangar on demand, and flown straight away. Its maintenance is in the hands of Air Couriers, Ltd., although it is now kept at Panshanger, Herts.

Replacement Problems

During winter, which is a relatively slack season, it is flown at least once per week if not gainfully employed, but it is always on stand-by for emergency use, and the pilots keep an overnight kit in their offices at Fanum House. Although 'HKV "still keeps going when the rest have stopped," and offers no spares problem at the moment except for things like cowlings, which are no longer available—it will, of course, become progressively more expensive to operate as time goes on. Sooner or later some parts will have to be specially made, but until then the Rapide, like the DC-3, is likely to remain irreplaceable.

Something like the Dornier Do 28, with STOL capability and a spacious rear cabin with excellent visibility, might well be the answer. But it will probably have to be British.

For traffic observation and control, the thoughts of the A.A. over the past few years have naturally been turning towards the helicopter, and rotorcraft have been chartered for special events, such as the opening of the M1. A.A. executives have also flown out to Fair Oaks from the Battersea heliport, with a great saving of time, and if a two/three-seat helicopter were commercially available for something less than £10,000, with comparably low running costs, the Association would undoubtedly look at it very hard indeed.

A helicopter to some extent would also solve the U.K. airfield problem, which the A.A., like every executive organization, occasionally comes up against. Somewhere like Scarborough, for example, where conferences are sometimes held, has no available airfield within a distance of nearly 50 miles by road, which negates the possibilities of air travel. Another inaccessible place by air is the A.A. office at Truro, where the nearest airfield—St. Mawgan—is something like 30 miles away by road. "East Anglia," comments Don Whitehead wryly, "is covered with airfields which you cannot use."

One by-product of the A.A. air activity, which is likely to be of value to the private pilot, is the current scheme of numbering all its road-boxes with an adjacent 10-ft. letter and figure, designed to be read with ease from 2,000 ft. These were originally intended for air-ground reference by the A.A. pilots, in liaison with the road patrols, but on completion their code combinations will be issued in a little booklet, which will give their location, plus the course and distance to the nearest airfield.

All but one of the signs around London are in position, and will be maintained by the A.A. patrollers, who also look after their particular box. The scheme is yet another indication that the "Automobile Association and Aerial Association" is living up to its traditions of service both on the road and in the air.—JOHN FRICKER.

Aviation News in General

BEAGLE UNIFIED.—British Executive and General Aviation, Ltd., has announced that the financial and other arrangements whereby the aviation business of F. G. Miles, Ltd., becomes a component of the Beagle group have now been completed. This group now comprises the parent company and its two subsidiaries Beagle-Miles Aircraft, Ltd., and Beagle-Auster Aircraft, Ltd.

DEFINITIVE RALLYE.—The second prototype Morane-Saulnier 880 Rallye Club, with a 100-b.h.p. Continental engine, a larger cabin, swept fin and faired undercarriage, made its initial flight at Villacoublay on Feb. 10. Production Rallyes will conform to the design of the second prototype, which is currently undergoing C. of A. flight trials.

BOEING VARIANT.—For rapid casualty evacuation and cargo and troop movement MATS is to obtain 30 transport versions of the Boeing KC-135A Stratotanker. Designated C-135A, they will have refuelling equipment deleted and deliveries will begin in June. More than 440 KC-135s have now been delivered to SAC.

MORE JETSTARS.—Six more Lockheed C-140 JetStars have been ordered for the U.S.A.F. and two JetStars are to be delivered to the U.S. Navy. Some of the U.S.A.F. aircraft are to be used by the special air missions wing of MATS; five C-140s had previously been ordered for the Airways and Air Communications Service.

GERMAN F-104s—The West German defence ministry has said the first F-104G Starfighter to be built in Germany will be completed next November; 604 are to be built by 1964.

ROTARY-WING RECORDS. — Ten World distance and speed helicopter records and the women's height record are being claimed by the Bell Helicopter Co. for flights made by the Model 47G Trooper and the 47J-2 Ranger.

FLOATS WANTED.—Following the news of progress in the formation of the Seaplane Club (THE AEROPLANE AND ASTRONAUTICS, Feb. 17) we hear from Air Cdre. G. J. C. Paul that the Club has received the offer of a Tiger Moth. He is now in search of a pair of floats for it and would be glad to hear from anyone who can help.

U.S. LIGHTPLANES.—According to the Aircraft Owners and Pilots Association, the U.S. light aircraft industry delivered 7,588 new machines during 1960 for general aviation. These figures do not include any aircraft delivered to scheduled airlines, which operate less than 1,900 of the 100,000 civil types now registered with the F.A.A. The 1960 deliveries represent a 1.3% decrease from the 1959 total but the unit value per aircraft has risen by 16.8% to an average of $26,571.7.

KATANGAN MAGISTERS.—Despite denials on all sides, as we reported last week, that the recently formed Katanga Air Force was to receive jet aircraft, three Fouga Magister twin-jet trainers arrived at Elisabethville on Feb. 16 in a Stratocruiser chartered by Seven Seas Airlines. The Magisters were flown from Toulouse, where they are manufactured, and are reportedly the first of nine for the K.A.F. The French authorities are investigating the delivery of the Magisters.

FRENCH EXPORTS.—Sales of the Caravelle boosted the French Aircraft Industry's exports in 1960 to 1,142 million N.F. (nearly £83 million). This figure is more than double that for 1959. Three-fifths of the exports were civil orders.

RIGID ROTOR.—A Bell helicopter with a three-bladed rigid rotor has successfully completed a test programme at Fort Worth. Several flights at speeds up to 100 m.p.h. were made under varying conditions.

NAVIGATION PRIZE.—The Council of the Institute of Navigation is to award annually a 25-guinea prize for the most notable paper submitted by anyone under 30 years of age. Papers should not exceed 3,500 words and must reach the executive secretary by Jne. 30 in any year. Four copies with a covering letter should be submitted; the author's name should not appear on the papers.

SPUTNIKS IN LONDON. — Replicas of the Russian Sputniks and Luniks will be shown for the first time in Britain at the Soviet Trade and Industrial Exhibition to be held at Earls Court, London, Jly. 7-29.

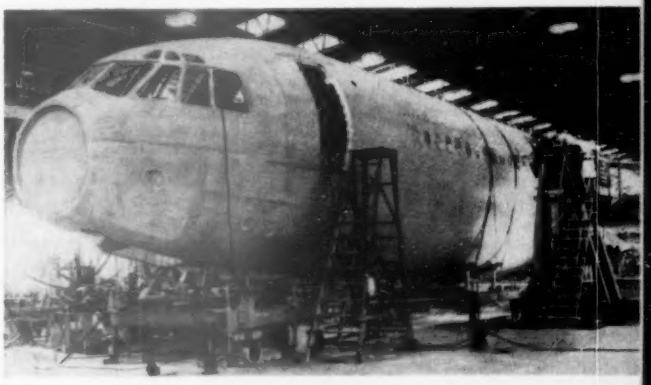
G.P.O. SPACE LINK.—Site of the ground station to be established by the G.P.O. for co-operative experiments with the United States in satellite communications will be somewhere in South-West England. It will embody a large steerable aerial system.

MOON LINK.—Two-way telephone conversation between the United States and Great Britain, using the Moon as a reflector for radio signals, may be demonstrated before the end of the year. British end of the radio link will be at Frogmore Hall, Hampshire, research centre of the American-owned Standard Telephones and Cables, Ltd.

ROCKETRY IN LONDON.—Five examples of small sounding rockets used by the U.S. Navy for upper-air research can be seen at the Science Museum, South Kensington, S.W.7, until Mar. 10. They are Asp, Arcas, Deacon, Hasp and the 2.75-in. FFAR.

SCOUT ORBIT. — A 12-ft.-diameter "Polka-Dot" balloon satellite was successfully placed in orbit by a four-stage Chance Vought Scout launched from Wallops Island, Virginia, on Feb. 16. It was the first all-solid rocket to establish a satellite.

SPACE MINISTER.—A Bill "for the establishment of a Minister of Space Research and Development" will be sought in the House of Commons on Mar. 21 by Mr. Woodrow Wyatt (Labour, Bosworth).



VC10 PROGRESS.—The nose section of the first Vickers VC10 has now joined the centre fuselage in the final assembly jig at Weybridge.

Commercial Aviation Affairs

CIVIL EAST FORTUNE. — While work is in progress on the runways and aprons at Edinburgh (Turnhouse) Airport, from Apr. 5 to about the end of July, all flying will be stopped there. East Fortune, some 15 n.m. E.N.E. of Edinburgh, will be used instead; it has two 6,000-ft. runways and a temporary terminal building is being erected.

DOMESTIC BID. — Cunard Eagle Airways has applied to the Air Transport Licensing Board for permission to operate services on four routes between London and Birmingham, Edinburgh, Glasgow and Manchester at a basic frequency of two flights a day using Viscounts, DC-6Cs, Britannias and later Vanguards, Tridents or DC-11s.

TWO-CREW VANGUARDS. — The Canadian Department of Transport has certificated the Vickers Vanguard for two-crew operation but requires both pilots to have an airline transport pilot licence.

IFR FOR MANCHESTER.—From Mar. 1 IFR procedures will apply in all weather conditions in Manchester's control zone (the boundary of which was, with the terminal control area, revised early this year). As with the London Zone special IFR clearances may be obtained though the aircraft concerned will normally be expected to be in R/T contact. Local flying and entry-exit lane procedures for Ringway, Woodford, Speke and Barton are explained in NOTAM No. 65/1961.

HELICOPTER FLIGHT DIRECTOR.—The cockpit of the S-55 used for M.o.A.-sponsored work by B.E.A. on helicopter flight director development (see last week's issue, p. 183). On the left is the experimental "barber's pole" collective-pitch director. On the right, above the coaming, is one of the Zero Readers and the director control panel.

A COMET CERTIFICATE.—At the request of Latin American operators of the Comet, de Havilland recently obtained an F.A.A. Airworthiness Certificate for the Comet 4C. Some modifications were necessary to obtain the American C. of A. which permits operation at slightly higher take-off and landing weights than does the British equivalent.

TWIN PIONEER ORDERED.—De Kroonduif N.V., the Dutch New Guinea associate of K.L.M., has ordered a Twin Pioneer Series 3 from Scottish Aviation and plans to convert its other two Pioneers to this standard.

SABENA CARAVELLE.—The first Caravelle VI for Sabena was formally handed over at Brussels on Feb. 10 and the first service was flown by this aircraft on Feb. 18. Two more will be delivered this month.

MANCHESTER LINKS.—Cunard Eagle Airways is purchasing two Viscounts to operate on its passenger services from Manchester this summer. Destinations to be served are Hamburg, Frankfurt, Rotterdam and Copenhagen with mixed class flights starting in April and Rimini, Pisa, Ostend and Bergen with tourist flights starting in May.

B.O.A.C. TO LIMA.—After a gap of exactly 10 years B.O.A.C. will resume services to Lima, Peru, on Apr. 11 using Boeing 707s at a twice-weekly frequency. Stops will be made at New York and Nassau and the elapsed time will be 18 hr. 20 min. outbound and 17 hr. 15 min. inbound. The aircraft will carry 32 first-class and 92 economy-class passengers.

AMERICAN APPOINTMENTS.—Mr. Elwood R. Quesada, former Administrator of the F.A.A., and Mr. James H. Douglas, former Secretary of the Air Force, have joined the board of American Airlines.

FLIGHT RECORDER USE.—A conference is to be held by the F.A.A. on Mar. 7 and 8 to discuss with airline operators, instrument makers and others the need for flight recorders to be carried on all aircraft of more than 12,500 lb. weight.

CHEAPER TO PARIS.—Starting on Jne. 23 Silver City Airways' "Silver Arrow" service to Paris will be operated from Lydd (Ferryfield) instead of Manston with a coach link from Victoria coach station replacing the rail link used last year. The fare will be reduced to £8 15s. for the return journey, including the railcar link between Le Touquet and Paris.

AIR CONGO.—A company of this name has now been set up in the Congo Republic with the help of Sabena, and some aircraft previously used in the Congo by Sabena are now operating in Air Congo markings. The formation of an airline to be known as Air Katanga, operating in the "breakaway" Congo province, has also been reported.

GUEST PLANS.—Using two Comet 4Cs leased from Mexicana, Aerovias Guest plans to introduce jet services on the middle-Atlantic route from Mexico City to Paris on Mar. 1. Three round trips a week will serve Miami, Bermuda, Santa Maria, Lisbon and Madrid and a weekly Mexico City-Miami service.

U.S. STRIKE HOLD-UP.—Last week-end American, Eastern, National, Pan American, T.W.A. and Western operations were seriously affected by the strike of flight engineers who were protesting against a federal order that pilots and engineers should select one union. About 70% of the flights from the New York airports were cancelled.

SEABOARD NAME CHANGE.—A change of name has been proposed by the directors of Seaboard and Western Airlines Inc., who will invite stockholders to approve the new name of Seaboard World Airlines Inc. at the annual meeting in April.

CZECH-LEBANON ACCORD.—A bilateral agreement has been concluded between Czechoslovakia and the Lebanon, allowing M.E.A. to include Prague on its services between Beirut and other European cities, and allowing C.S.A. to serve Beirut and beyond. An agreement between East Germany and the Lebanon is being negotiated.

NOVEMBER TRAFFIC.—Capacity ton-miles offered by U.K. airlines on scheduled services in November, 1960, increased by 30.1% but total traffic went up by only 18.1%, producing a drop in overall load factor from 58% to 52.7%. Freight ton-miles increased during the month by 4.9% and mail ton-miles by 18.3%.

News About People

FROM SPERRY TO SMITHS.—Mr. R. E. Leete has relinquished his position as sales and contracts manager of the Brentford division of the Sperry Gyroscope Co., Ltd., to join Smiths Aircraft Instruments, Ltd., as contracts manager.

SERVICE LIAISON.—To maintain liaison between the company and the R.A.F., A. V. Roe and Co., Ltd., has appointed Gp. Capt. A. K. Hunter as service liaison officer. Gp. Capt. Hunter was a member of the technical branch of the service from 1940 until his retirement.

APPOINTMENT DOWN UNDER.—Far East representative of Handley Page, Ltd., since 1947, Mr. A. F. Bandidt has now become managing director of Sir George Godfrey and Partners (Australia), Pty., Ltd. In 1946 Mr. Bandidt made the first post-war solo flight from the U.K. to Australia, piloting a Miles Gemini.

Gp. Capt. A. K. Hunter, whose appointment is recorded alongside.

NAPIER DIRECTOR.—Mr. P. J. Daglish, who joined D. Napier and Son, Ltd., as a special executive last September, has now been appointed commercial director of the company. Before joining Napier he was manager of the English Electric Co.'s aircraft equipment division.

VICKERS CONTRACTS.—Mr. H. G. Dorn has become contracts manager of Vickers-Armstrongs (Aircraft), Ltd. Since 1959 he has been military contracts manager.

ELECTRONICS DIRECTORS.—New directors of Ekco Electronics, Ltd., are Mr. J. Corbishley and Mr. S. A. Clodd. Both are on the board of E. K. Cole, Ltd.

FOR LIFT AND PROPULSION

ROLLS-ROYCE

power for

VTOL

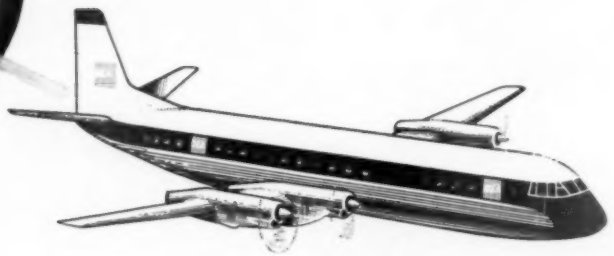
ROLLS-ROYCE LIMITED · DERBY · ENGLAND

AERO ENGINES · MOTOR CARS · DIESEL AND PETROL ENGINES · ROCKET MOTORS · NUCLEAR PROPULSION

Key equipment for the

VICKERS
VANGUARD

Like every other British pressurized aircraft—and many of overseas design—the Vickers Vanguard carries Normalair equipment. Normalair pressure control units maintain low-altitude conditions in passenger and crew cabins as the airliner cruises some 5 miles up. Normalair vapour cycle cooling equipment is available, if required, to assure complete passenger and crew comfort in particularly trying climatic conditions.



NORMALAIR LIMITED YEOVIL ENGLAND

EUROPE'S LARGEST AND MOST EXPERIENCED PRODUCERS OF AIRCRAFT CABIN AIR CONDITIONING SYSTEMS AND COMPONENTS

NORMALAIR (CANADA) LTD., TORONTO **NORMALAIR (AUSTRALIA) PTY., LTD., MELBOURNE**

Implications of the White Paper

GREATER stability for the aircraft industry would seem to be likely if the Government holds to the policies put forward in the 1961 Defence White Paper. But a glance through previous White Papers shows how often defence policy turns somersaults. This is inevitable; the Paper itself says: "there can be no finality" about defence planning—"deployment and balance must be continually re-examined." The 1961 Paper confines itself to stating policy and does not, as in the past, include lists of actual weapons.

Most important of the policy decisions announced is that Britain is to maintain an independent strategic nuclear deterrent and that for the next 10 years this will be provided by weapons carried in aircraft. This decision is based on the official view that the defences of Russia and China are not as strong as believed in some quarters and that as defences are strengthened, the use of stand-off weapons and electronic counter-measures will maintain the effectiveness of bombers. Trials of Blue Steel are under way and it is understood that, in emergency, this weapon could be used now.

On the subject of air-launched ballistic missiles, the White Paper states: "The missiles which carry the British-made warhead from the aircraft to its target must be of such type and characteristics as will prevent the greatest diversity of attack." Skybolt is expected to take its place in due course, but alternatives are obviously being studied in case this American weapon fails to materialize. No British research and development effort is being devoted to Skybolt, and this leaves capacity available for the study of British systems.

Maintenance of the British nuclear deterrent costs 10% of the defence budget; this includes the cost of the V-bomber force, Blue Steel, Skybolt, Thor, and nuclear weapon research and development. It excludes the cost of Fighter Command and surface-to-air missile defence of bomber bases.

It is officially considered essential for Britain to maintain its nuclear deterrent; one important reason is that it increases British influence in negotiating a nuclear test agreement, disarmament and the reorganization of NATO strategy. It is believed that international agreement on nuclear tests may be reached this year, but the necessary monitoring system is expected to be very expensive.

The possibility of using Polaris submarines for the British nuclear deterrent has been shelved for the moment; the Government intends to keep its eye on other deterrent systems. One example is the Minuteman ICBM, but no immediate decision is considered necessary.

The White Paper states that tactical aircraft equipped with nuclear weapons are now operated from carriers by the Royal Navy as well as by the R.A.F. A strategic rôle for the T.S.R.2 is possibly suggested by the statement: "New types of aircraft for tactical and strategic rôles will be able to make their attacks at very low levels. . . ." The future of the T.S.R.2 has been widely debated; the White Paper decision on deterrents suggests that its development will go forward. But the quote above could be taken to imply that a strategic low-level bomber will be developed.

Discussing NATO, the White Paper states that Britain would be willing to participate in a NATO pool of tactical nuclear weapons.

On new defence projects, it is said: "If we are to maintain our position in the World, we must be ready to start new research projects, however complex they may be. Equally we must be ready to scrap anything that has served its purpose, become outmoded, or whose ultimate cost may prove to be beyond our resources."

The aim is to avoid developing "Chinese copies" of American and Russian projects. Greater strength is being given to the British scientific committees which influence defence projects. Better techniques have been introduced to monitor the progress of new weapons and aircraft. For example, T.S.R.2 progress and costs are regularly surveyed in detail on "milestone" dates.

Another technique has been introduced to prevent projects being developed for several years and at extreme cost before they have to be cancelled. This is the placing of a wide range of feasibility study contracts. For example, five of these feasibility studies may be put in hand at a cost of £1 million when only one is to be chosen for final development. The studies permit development time scales and costs to be assessed more accurately in advance.

Another pointer to the future is the statement that "There must be the maximum possible degree of harmonization of Service requirements through the research, development and production stages. In particular, special attention will be paid to this requirement in the planning of successors to the current generation of aircraft." This refers to the development of aircraft types which can be operated by both the Royal Navy and R.A.F. Their requirements cannot normally be reconciled without severe performance penalties.

This should not be the case with VTOL types; it should be much simpler to produce VTOL fighters and strike aircraft which can be operated by both Services. If the Navy goes over to VTOL types, it could greatly influence the size and type of aircraft carrier which it will need in future.

Total cost of the 1961-62 defence budget will be £1,655.6 million, compared with £1,616.33 million for 1960-61. It is made up as follows (figures for the previous year in brackets): Admiralty, £413.20m. (£397.50m.); War Office, £506.9m. (£487.45m.); Air Ministry, £526.67m. (£529.46m.); Ministry of Aviation, £190.20m. (£185.35m.); Ministry of Defence, £18.63m. (£16.57m.). The total cost of defence to the British taxpayer will go up by £51 million because the previous figure includes a German contribution of £12 million for support costs. Estimated strengths of the Services on Apr. 1, 1962, will be Royal Navy, 95,600; Army, 198,700; R.A.F., 149,900.

Gp. Capt. F. O. Soden

WE regret to record the death in London, on February 12, of Gp. Capt. F. O. Soden, D.F.C., one of the great "characters" of the R.A.F. and in post-war years an enthusiastic protagonist of sporting and private flying. Born in 1895, he served with the R.F.C. in the First World War. He held a number of commands between the Wars and from December, 1940 to June, 1941 was station commander at Biggin Hill; later he served in the Middle East.

"Polygon" writes:—

I first met "Mongoose" Soden in 1922 out at Mosul in Northern Iraq. He was a Flight Commander in No. 1 Squadron flying Snipes and we became friends because we had both been fighter pilots in the Kaiser War. His skilled leadership did much to drive back the Turkish Army when they invaded Iraq without declaring war.

He derived his nickname, of course, from his resemblance to the charming little snake killer, and in many ways his character was akin to that little animal, for he was quiet of mind and courageous to the last degree. He was always intolerant of snakes in the grass—particularly those which clamber for promotion on the backs of horses or in office chairs rather than in the cockpit of an aeroplane.

I recall an occasion, between the Wars, when he was commanding a squadron of obsolete slow biplane night bombers. He was flying back to his aerodrome, struggling against a strong wind, and instructed his wireless operator to send an immediate urgent signal to his Air Officer Commanding. The signal was rushed to the desk of the great man who read: "Green Line buses passing me. What shall I do?"

Always in war or peace "the goose" preferred the hardships and dangers of flying to the comforts of the office chair. Indeed for many years he had his own private aeroplane and was flying in Kenya only shortly before he was rushed home for an emergency operation. I heard from a friend in Kenya that he and his aeroplane did noble work in evacuating refugees from the Congo, and also that some of the rebel forces held him prisoner for a while.

Mongoose never achieved high rank in the Royal Air Force for his intolerance of stupidity in high places and his outspoken views never endeared him to the Air Council. Neither is he known to the general public, for he shunned notoriety. He was one of that small and fast diminishing band of experienced officers who fought in the Kaiser War; and he had an almost fanatical love of flying.

Such a man bore the burden and heat of the day while Trenchard was forging this great new weapon of the Royal Air Force. They did the flying. They were the leaders of the Flights and of the Squadrons while all the time they were arguing and pressing for new and better aeroplanes.

Coventry Occasion

DEVELOPMENT models of the Bristol Siddeley BS.75 civil turbofan will be built at Coventry and much of the work on the engine will be done there. This was stated on Feb. 10 by Sir Arnold Hall, managing director of Bristol Siddeley Engines, Ltd., at the annual dinner of the company's Coventry apprentices association. He emphasized that there was no intention of removing aero-engine manufacture from Coventry although engineering work had been transferred to Bristol.

Discussing the future, Sir Arnold said that the international standing of Bristol Siddeley was rising, and so were its exports. Advanced engineering of the type practised by the company was vital to the economic future of Britain.

Industry Record

More Comet Equipment

From Smiths Aviation Division comes the news that the five Comet 4Cs on order for Transport Command are to be fitted with the Kelvin-Kollsman cabin pressure control system. Similar equipment has already been specified for the D.H.121 Tridents for B.E.A. and the Short SC.5 Belfast strategic freighter for the R.A.F.

Based on the KS-69 system developed by Kelvin and Hughes' American associates, the Kollsman Instrument Corpn., the total weight of the components forming the basic system is approximately 26½ lb.

An Anglo-American Link

Research and Engineering Controls, Ltd., of 9 Old Bridge Street, Kingston-upon-Thames, is a new company formed as an associate of the Rosemount Engineering Co. of Minneapolis, Minn., to manufacture under licence and market its products in Europe. The Surrey firm is also to undertake development and production orders for the American company and expects, as its activities expand, that a considerable amount of its output in this field will go directly to the U.S.

Rosemount Engineering products which will now be available from Research and Engineering Controls include total temperature probes with a range of −100° C. to +350° C., compensated pitot-static tubes, pressure transducers and altimeters, platinum resistance immersion probes for temperature ranges from that of liquid helium to +1,500° F., direct reading temperature bridges, temperature monitoring and controlling systems.

Directors of Research and Engineering Controls are Mr. B. Rogal, B.Sc.(Eng.), A.M.I.E.E. (managing), Mr. R. W. Sutton and Mr. J. G. Gallagher of White, Weld and Co., Ltd., New York.

Turbojet Test Plant

Designed by Heenan and Froude, Ltd., of Worcester, a new jet-engine test plant is to be installed at Air India International's engine maintenance base at Santa Cruz Airport, Bombay. Although rated for engines of up to 30,000 lb. thrust it will be used primarily in conjunction with the Conway Mk. 508 by-pass engines which are installed in the Air India Boeing 707-437s.

The plant's inlet and exhaust sound-proofing is by Cullum Detuners, Ltd.

This new form of "split pointer" A.S.I. by Kelvin and Hughes was originally developed for stand-by use in the D.H. Trident. During the first revolution of the dial the two concentrically mounted pointers move together to give a reading on the outer scale; at the start of the second round the longer pointer is stopped and hidden by a raised mask on the dial plate. In these pictures the A.S.I. is reading 110 kt. (left) and 310 kt.

Dunlop in 1960

Last year was a good one for the Dunlop Aviation Division. Exports of aircraft equipment together with disc brakes and life-rafts rose to £1,900,000, an increase of 21% on 1959 which was itself a record year. Not included in this figure are indirect exports such as wheels, tyres, brakes and anti-skid units fitted to British aircraft sold abroad.

The aviation servicing school run by the company continued to expand. It is open to any member of NATO air forces or employees of organizations dealing with the construction, maintenance, operation or inspection of aircraft as well as students of schools and colleges; and 11,642 pupils from 67 countries have now been given free training since 1945.

Other Dunlop news is that a £750,000 rubber reclaim plant is to be set up at Liverpool as a result of an agreement between the Dunlop Rubber Co. and the U.S. Reclaiming Co. of Buffalo, N.Y.

Mayday Aid

A further 300 type D.103 UHF airborne emergency transmitter-receivers are to be supplied to the R.A.F. by W.S. Electronics, Ltd. Purpose of the set is to provide a pilot with air-to-ground communications when his aircraft power supply system or main communications equipment fails.

Transmissions are made initially on a UHF international distress channel. Once contact is established the set is switched to an alternative frequency thus clearing the emergency channel. Similar equipment worth £50,000 was ordered by Denmark at the end of last year.

Aircraft Glass by Triplex

Extensive alterations, now completed, have produced what will be virtually a new aircraft-glass department at the King's Norton, Birmingham, factory of the Triplex Safety Glass Co., Ltd. Described as consolidation rather than expansion, the developments have embraced also the gold-film heated glass section, which has doubled in size. Total cost of the work is approximately £33,000.

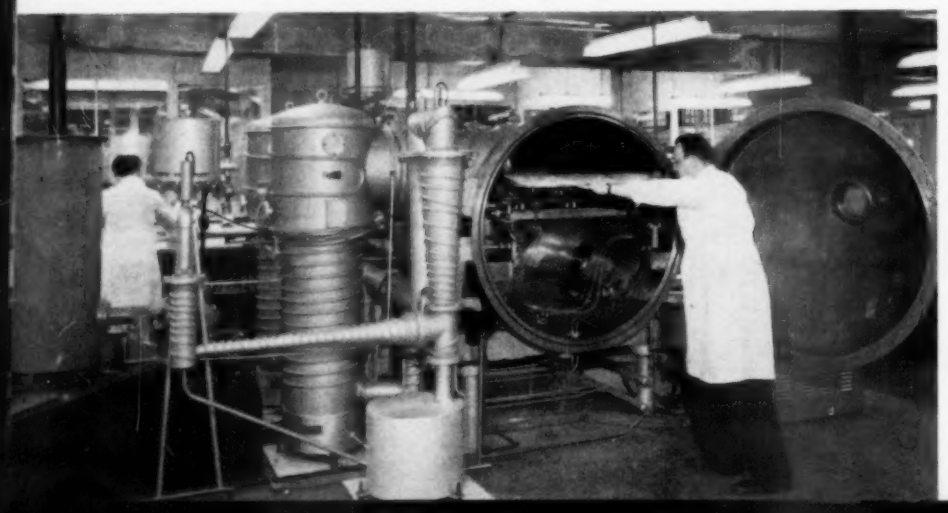
Production of gold-film glass for military and civil aircraft and for diesel railway locomotives is expected to be doubled now that new equipment has been installed. A £13,000 vacuum vessel sputters on to the glass a thin layer of gold which will transmit electric current. This layer, after further processing, is capable of carrying up to 800 W/sq. ft.; the heat generated is used to deice or demist aircraft windscreen panels. These panels are made to withstand extreme temperature ranges, going as low on occasions as −80° C.

The new plant will also allow the processing of panels with a high degree of curvature, something not possible with the original plant. In addition to the vacuum vessel in the gold-film section there is a new baking oven to improve the quality of the gold-film glass and lower its electrical resistance. A gas expansion refrigerator capable of reducing temperature to −160° C. has been incorporated for testing of gold-film panels.

A completely new assembly room provides dust-free air-conditioned facilities. Here glasses and interlayer materials are put together in a temperature of 60° F. with 15% relative humidity. The toughened or laminated glass, the vinyl plastic interlayer and the air-space rings and other metal components of the aircraft screens are all brought together in this department. Glass direct from the adjacent gold-film section comes into this room without having to pass through unfiltered air.

A high frequency welding machine has been added for electric heating and sealing of the plastic bags in which the aircraft glasses subsequently enter the autoclaves.

In a completely new section, Thiokol synthetic rubber is moulded around the aircraft panels and afterwards cured to seal the edges against atmosphere or moisture. The curing process, which could be carried out at room temperature, is accelerated and completed overnight by placing the panels in a warm oven. The rubber seal also acts as a buffer between the glass and the aircraft fuselage. Panels finished by this new process can be manufactured to dimensional limits of 0.005 in. Because the rubber gives a true mounting surface, no additional adhesives are needed when panels are installed in aircraft.



The vacuum vessel installed by Triplex in the gold-film room of its aircraft-glass department at King's Norton.

Correspondence

Runway Stresses and Undercarriage Layouts

IN the choice between D.H. 121 Trident and the Boeing 727 which faces some airlines there appears to be a factor which has its roots in misunderstanding of the stress situation in runway pavements caused by various tyre loading patterns. Specifically there seems to be a misapprehension that the 727, which has only two tyres per main landing gear leg, but uses lower tyre inflation pressures, will cause lower stresses than will the Trident with its four-tyred legs, even though the 727 is expected to be a heavier craft. This is not the case except in the top few inches of the total supporting structure, where higher strength materials are in any case used.

Tyre loads are often considered to spread out, with progressing depth, at an angle of 45° to the vertical, or a slope of 1 : 1, from the circumference of the tyre contact areas. If a circular contact area of radius 10 in. is assumed, for example, then at a depth of x inches the radius of the circular area carrying the total load will be (10+x) inches.

Four small contact areas have more circumference than two large ones and hence the spreading of the loaded area is faster in the former case, so that the stress decreases more rapidly with depth under the four-wheel gear and quickly produces a preferable stress condition in comparison with the two-wheel gear, even though the latter may have begun with a larger contact area because of lower inflation pressure (within reasonable limits).

This can be readily illustrated by another hypothetical example. Let us assume identical loads on two gear legs, one having two and the other four tyres. Suppose the leg load is 40,000 lb., that contact areas can be assumed circular, that tyre casing strengths may be ignored, and that loads are distributed at the 45° slope already mentioned. In the first case (two tyres) tyre pressure and, hence, contact pressure, is 75 p.s.i., while in the second it is 100 p.s.i.

	Case I (Two tyres)	Case II (Four tyres)
Load per tyre :	20,000 lb.	10,000 lb.
Contact area, 1 tyre :	267 sq. in.	100 sq. in.
Diameter of contact area :	18.4 in.	11.3 in.
At depth, 3 in. :—		
Diameter of loaded area :	24.4 in.	17.3 in.
Corresponding loaded area :	468 sq. in.	235 sq. in.
Vertical stress :	42.7 lb./sq. in.	42.5 lb./sq. in.

At a depth of 3 in. in our example the stresses are virtually equal, and it may be seen that, if the trend continues, the two-tyred gear will actually cause the greater stresses in spite of lower tyre pressure at greater depths.

In view of the greater weight expected of the 727, there should be very little advantage indeed resulting from the landing-gear characteristics of this craft in relation to pavement stresses, when comparison is made with the Trident.

Ottawa, Ontario, Canada. PETER T. HODGIN (P.Eng.).

Participation in Space Research

I SHOULD like to comment on the articles by Greenwood (Jan. 27) and Cleaver (Feb. 3) anent U.K., Commonwealth and European participation in space research.

Firstly, I find myself in much closer agreement with Cleaver's views than Greenwood's. Indeed, like Cleaver, I am astonished that Greenwood, whilst in one breath anticipating and favouring world co-operation in astronautical ventures, in another breath can see no hope of successful U.K. co-operation with either the rest of the Commonwealth and/or Europe! I submit that this does not make sense.

I further disagree most emphatically with Greenwood as regards the impossibility of the U.K. "going it alone" in a space programme. In fact, judging by undertones running through popular and technical Press reports, I gain the impression that Britain is already committed to just that, come what may. Certainly, and apart from any Governmental action, the U.K. aviation world is engaged in astronautical project studies. And now—perhaps the most significant pointer—we have news of the formation of the British Space Development Company, for which farsightedness Sir Robert Renwick and his associates are to be congratulated. I venture to predict that the founding of B.S.D.C. will go down in history as marking a major turning-point in the fortunes of this country.

Cleaver, whilst agreeing (as I do) that we should collaborate with the U.S., points to some dangers of relying too completely on our American friends. I have myself received many kindnesses from Americans, and in ultimate crisis there is no doubt that we would say to them: "We are you, and you are us: blood is stronger than vodka." But let us not be blind to the fact that America would give us as little credit as possible for any major astronautical achievements. . . . I will be blunter than that: America will tolerate help but NOT effective competition.

Harsh and ungrateful as these words may sound, I believe

Groundabout

Project Sunderland. Peter Thomas, who organized the successful Save-the-Sunderland crusade, needed all his Welsh fortitude to sustain him in the battle. Getting the promise of a prime specimen was only the end of the beginning of his troubles. For instance, before the French kindly offered beaching gear to go with their Sunderland, there was the prospect of having to lift the great boat by means of a ????? and placing it on a ???? where it would have been secured with a ???? Then, too, its 112-ft. span has to be got through the 104-ft. gap between the dockyard wall and the old station church. Even after installation, its upkeep will present a problem. Mr. Thomas might get some tips from Convair, whose enshrined B-36 is voluntarily maintained by dedicated employees.

*

"They've shot a rocket at *Venus*? Sounds 'armless enough."

*

Asymmeteorology

"The only reason I knew that one of the Meteor's engines had stopped was that one minute the sun was in my eyes, the next it wasn't."—*Air Cdre. "Teddy" Donaldson.*

*

Hair of the Dog. "Among the passengers, a live puddle was carried from London to Aden by M.E.A." Obviously for some homesick Londoner.

*

Mess Games. Several readers, one of whom proposes producing some sort of Pilot's Notes on the subject, want to know of more R.A.F. Mess games. Well, here's the first of a few more. During a lull in the after-dinner speeches, fill a half-pint glass with water, lay a sheet of notepaper on top, then holding them firmly together, turn the lot upside down. The paper *should* seal in the water. You then set light to the corner of the paper and hand the lot to the next chap who hastily passes it on, preferably in the direction of the top table. Any questions?

*

Vintage Dept. Trust the R.A.F. Association for a bright idea. The Potters Bar Branch will celebrate the Mosquito's 21st birthday with a Midsummer's Eve Ball in the hangar at Salisbury Hall, the prototype's permanent home. Famous ex-R.A.F. types have been invited to dance and drink under the graceful wings of the Wooden Wonder, while another bar (the R.A.F.A. think of everything) will be operating in an old air-raid shelter outside. There the ex-flyers can drink and reminisce to the recorded sounds of air-raids and airfield operations.

*

by Gregory

Correspondence . . . .

them to be true. At least this viewpoint, supported by evidence such as Cleaver has felt necessary to remark, should be borne in mind.

And now, having thrown a spanner at the Star Spangled Banner, let me exercise a time-honoured privilege of the British commoner—to criticize the Government. . . . I feel that a grave tactical error has been made, in that the U.K. should have founded a space programme before inviting other countries to join in. That would have given us leadership, and not made it appear that we are mainly anxious to save Blue Streak from the dustbin.

As it is, there is a prospect that Eurospace (heavens!—where is the Commonwealth?) will be born not with a silver spoon in its mouth but Charon's Penny, engraved with that most fatal of all words LEAGUE . . . of which the World has seen plenty, not excluding the British Commonwealth, right back at least as far as classic Greece, as Thucydides can tell you.

This, then, is the danger: not that Britain cannot afford a space programme but that U.K., Commonwealth, and European money will be frittered away for lack of centralized and decisive leadership . . . which, unlike Greenwood, I have the belief Britain can provide.

Holtspur, Beaconsfield, Bucks. H. E. Ross, F.B.I.S.

The Panther and the R.A.F.

WITH reference to Air Cdre. F. Kirk's letter "Swing-Tail First" in your Jan. 27 issue, I can confirm from personal knowledge of the Parnall Panther that it had a hinged tail section and certainly preceded the Canadair CL-44D-4 by many years.

The Panther dates from the 1917-18 period (at which time I was a member of the design team led by the late Harold Bolas as chief designer) and was described as a "Two-seater Ship Aeroplane for Reconnaissance Work with the Fleet." The fuselage was of wooden monocoque construction with the tail portion hinged just aft of the second cockpit and arranged to lie parallel with the starboard wings in the folded condition to facilitate stowage aboard ship.

I was not aware, however, that the Panther was introduced into the R.A.F. in the 1920s, since the works at Brislington, Bristol, were closed in the early part of 1919 and the design team disbanded, although later in the same year reformed (still under Harold Bolas) at the Coliseum, Park Row, Bristol, and in 1925 transferred to Yate.

During the '20s, apart from the numerous projects which never materialized, we designed and built the Puffin, Possum, Plover, Peto, Pixie, Imp, Elf and Pipit, but I cannot trace or recall any reference to the Panther during these years.

Brough, Yorks. C. P. TRUYENS.

[Owen Thetford ("British Naval Aircraft 1912-58") writes that the prototype Panther appeared in 1917. He then says that the original order for 300 was reduced to 150 with the Armistice and that these aircraft were built by Bristol at Filton during 1919 and 1920. They equipped Fleet Spotter Reconnaissance Flights aboard the "Argus" and the "Hermes."—ED.]

High Life Outside the Mess

TO those who occasionally like to mix fresh air with their fun and Mess games, the following may be recommended where suitable facilities exist. The game, so far as I know, was dreamed up by 47 Squadron when stationed at Protville, near Tunis. There, the Mess consisted of three marquees joined together so that the side elevation presented three peaks and two valleys.

This was the "Course." When the party within the canvas walls had reached a certain point and were moved by a suitable spirit, the "All out" was sounded and the contestants were lined up facing the first peak.

For the "Off" a Very pistol with the colours of the day was fired. A red was fired when the first man had finished the course. This was necessary as bodies in difficulties in the "valleys" (though often laughingly happy) had to be removed before the next heat could start. It was also necessary to inspect the inside of the Mess as bodies were apt to fall through where the marquees were alleged to be joined.

The rules permitted the hoisting of those of lively spirit, but of weak flesh, as far as the first slope; they were then on their own. Unless one was prepared to wallow, the technique was literally to rush one's fences. It was the only way.

And in case it should be thought that it is a game for men only, it should be said that at least two American nurses made the grade.

Kenton, Middx. T. C. MILES.

Publications Received

Who's Who in the Motor Industry.—The 1961 Edition of this established reference volume is completely revised and includes information on personnel, companies and organizations in the British car and commercial vehicle industries. 624 pp., 5¼ in. by 8¼ in., with index tabs. Temple Press Limited, 42s. (43s. 9d. by post).

Fate is the Hunter, by Ernest K. Gann. A personal account of experiences as an airline pilot before, during and after the War, by one of America's leading contemporary novelists. 352 pp., 5¼ in. by 8¼ in. Hodder and Stoughton, 21s.

Great Moments in Battle, by Ronald W. Clark. The 10 stories told in this volume include two of aviation interest—"The Day the Luftwaffe Lost the War" and "How the Atlantic Battle was Won." 122 pp., 4½ in. by 7¼ in., illustrated. Phoenix House, Ltd., 8s. 6d.

Spaceflight Technology.—Edited by Kenneth W. Gatland. The proceedings of the first Commonwealth Spaceflight Symposium organized by the British Interplanetary Society in 1959. 366 pp., 5¼ in. by 9 in., illustrated. Academic Press Inc. (London), Ltd., 96s.

Aircraft Quiz, by K. G. Munson. Two hundred and fifty questions on general, military, civil and historical aviation subjects to help while away wet afternoons and long journeys. Answers are given for the benefit of those who ought to know (but have forgotten) which was the largest aeroplane ever built, which was the R.A.F.'s last fighter biplane and other such questions. 32 pp., 4 in. by 5¼ in., illustrated. Ian Allan, Ltd., 1s. 6d.

Civil Aircraft Markings, by J. W. R. Taylor. The 1961 edition of a useful pocket-book identifying by their registrations all current British civil aircraft and those foreign airliners which regularly visit our airports. 98 pp., 4½ in. by 7¼ in., illustrated. Ian Allan, Ltd., 2s. 6d.

Electronic Maintainability Vol. 3.—Edited by F. L. Ankenbrandt. A collection of contributed articles on all aspects of maintaining electronics equipment in usable condition. 312 pp., 5¾ in. by 9 in., illustrated. Chapman and Hall, Ltd., £4.

Aviation Calendar

Feb. 27

Coventry.—Lanchester College of Technology. Rocket Engine Technology lecture, "Rocket Engine Testing," by A. W. Broomfield, in the College, at 19.00 hrs.

Mar. 1

Hull.—R.Ae.S. Brough Branch lecture, "Aircraft Production Techniques," by A. R. Courtman, in the Royal Station Hotel, at 19.30 hrs.

London.—R.Ae.S. Graduates and Students Section A.G.M., in the Lecture Theatre, 4 Hamilton Place, W.1, at 19.30 hrs.

London.—Kronfeld Club, opening of the Photographic Competition, in the Basement, 74 Eccleston Square, S.W.1.

Mar. 3

London.—R.Ae.S. Rotorcraft Section lecture, "Helicopter Approach Aids," by H. W. Mitchell and S. G. Lennox, in the Lecture Theatre, 4 Hamilton Place, W.1, at 19.00 hrs.

Mar. 4

London.—B.I.S. lecture, "Possible and Impossible Alternatives to the Chemical Rocket," by D. S. Carton, in the Tudor Room, Caxton Hall, S.W.1, at 18.00 hrs.

Mar. 6

Coventry.—Lanchester College of Technology. Rocket Engine Technology lecture, "Scientific Value of Space Exploration and Present Achievements," by H. G. R. Robinson, in the College, at 19.00 hrs.

Mar. 7

London.—R.Ae.S. Astronautics and Guided Flight Section lecture, "Guided Weapon Control Equipment," by John Dent, in the Lecture Theatre, 4 Hamilton Place, W.1, at 18.00 hrs.

Company Notices

OVERSEAS COMPANY

Reliance Aviation, Ltd. (F.4995).—Particulars filed Jan. 31, 1961. Cap. £10,000 in £1 shs. Reg. in Republic of Ireland on Aug. 29, 1960, to establish, operate and maintain air services. British add.: 105 Christchurch Road, S.W.14. Hon. Anthony Savile, 48 Belgrave Mews North, S.W.1, is authorized to accept service of process and notices. Directors: Air Cdre. Paul Chamberlayne, Chamberlainstown, Fordstown, Navan, Co. Meath; Arthur C. Evans, The Headfort Estate Office, Kells, Co. Meath.

New Patents

APPLICATION ACCEPTED

864,540.—**D. Napier and Son, Ltd.**—"Turbine-propeller power units for aircraft."—Dec. 4, 1958. (Dec. 12, 1957.)

Printed specifications of the above will be available on Apr. 6, 1961, and the opposition period will expire on Jly. 6, 1961.

Personal Notices

BIRTHS

Bingham.—On Feb. 7, at R.A.F. Hospital, Ely, to Rae, wife of Peter Bingham—a son.

Dalziel.—On Jan. 27, at R.A.F. Hospital, Wegberg, to Yvonne, wife of Charles Dalziel—a daughter.

Dolman.—On Feb. 11, at R.A.F. Hospital, Cosford, to Rosemary (*née* Doorbar), wife of Flt. Lt. G. H. Dolman—a daughter.

Gayer.—On Feb. 9, at P.M.R.A.F. Hospital, Halton, to Jenny (*née* Wood), wife of Flt. Lt. W. A. Gayer—a son.

Gratton.—On Feb. 8, at R.A.F. Hospital, Nocton Hall, to Shiela, wife of John Gratton—a son.

Lambton.—On Feb. 4, at R.A.F. Hospital, Nocton Hall, to Joan, wife of Flt. Lt. D. Lambton—a son.

Lanyon.—On Feb. 5, in Germany, to Susan, wife of Flt. Lt. J. C. Lanyon—a daughter.

Paxton.—On Feb. 8, at R.A.F. Hospital, Ely, to Pamela (*née* Shadforth), wife of John Paxton—a daughter.

MARRIAGE

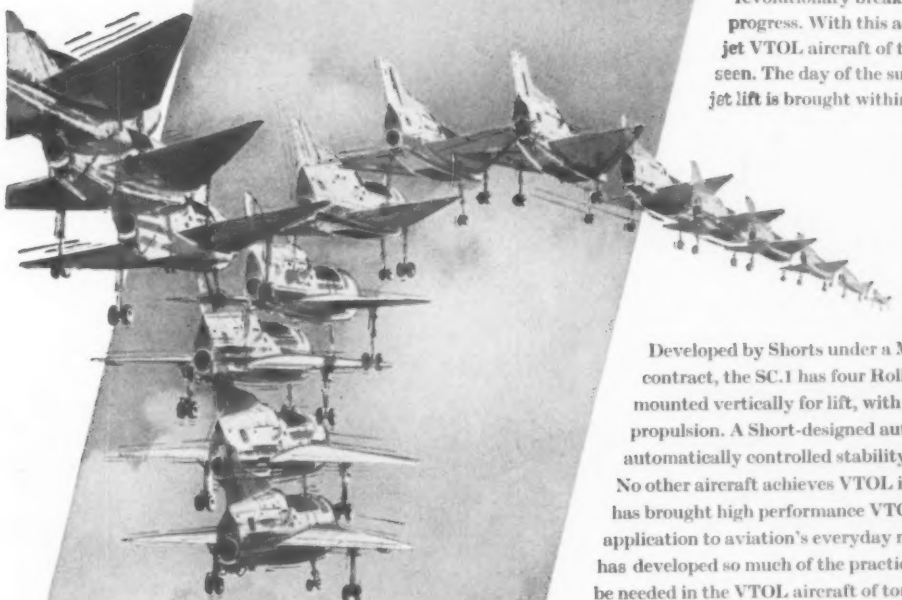
Oliver—Steyn.—On Feb. 11, at the Dutch Reformed Church, Cradock, Cape Province, Sqn. Ldr. Kingsley Oliver, R.A.F., to Isobel Steyn.

DEATH

Marsh.—On Feb. 1, Flt. Lt. Arthur Thomas Marsh, B.Sc., at R.A.F. Henlow.

The *Short* SC.1 goes forward

Successful transitions by the Short SC.1 VTOL aircraft from jet-borne hovering to wing-borne forward flight and vice versa mark a revolutionary break-through in aeronautical progress. With this advance the way to the pure jet VTOL aircraft of the future can be clearly seen. The day of the supersonic civil airliner using jet lift is brought within reach.



Developed by Shorts under a Ministry of Aviation research contract, the SC.1 has four Rolls-Royce RB.108 jet engines mounted vertically for lift, with a fifth at the tail for propulsion. A Short-designed auto-stabiliser system gives automatically controlled stability during hovering and transition. No other aircraft achieves VTOL in this way. No other aircraft has brought high performance VTOL to the stage of immediate application to aviation's everyday needs. And no other team has developed so much of the practical equipment which will be needed in the VTOL aircraft of tomorrow.

AT **Shorts** IDEAS TAKE SHAPE **on time**

SHORT BROTHERS & HARLAND LIMITED
Queens Island Belfast Northern Ireland
The first manufacturers of aircraft in the world

SYSTEMS INSULATION BY REFRASIL

The de-icing and de-misting systems of the English Electric Lightning are insulated with Refrasil lightweight blankets.

Higher operating temperatures make Refrasil blankets essential for all aircraft systems ducting. Refrasil will withstand 1000°C continuously.

Refrasil insulation blankets and integrally insulated ducting have an extremely long life, and are ideal for all aircraft systems involving high temperature air or gas. They are backed by the unique Refrasil design, delivery and after-sales services, plus the continuous assistance of the Refrasil Technical Advisory Service.

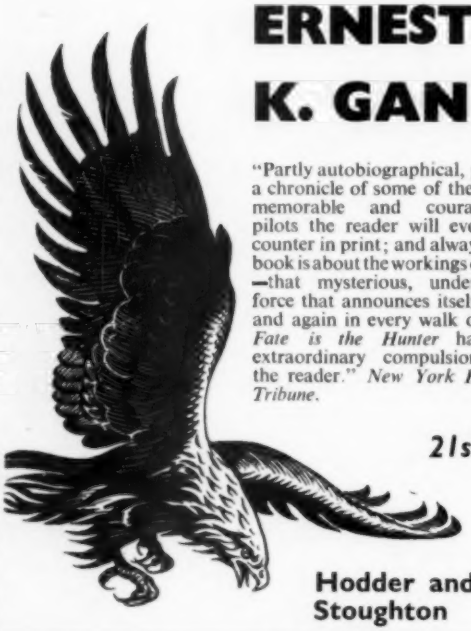
REFRASIL THE SUPREME LIGHTWEIGHT HIGH TEMPERATURE INSULATING MATERIAL

Write for details to: DARCHEM ENGINEERING LTD. (British Refrasil Div.) Stillington, County Durham, Stillington 351, Telex: 58549

A MEMBER OF THE DARLINGTON CHEMICALS LIMITED GROUP OF COMPANIES

Just Published

Fate is the Hunter



ERNEST K. GANN

"Partly autobiographical, partly a chronicle of some of the most memorable and courageous pilots the reader will ever encounter in print; and always this book is about the workings of fate—that mysterious, undeniable force that announces itself time and again in every walk of life. *Fate is the Hunter* has an extraordinary compulsion for the reader." *New York Herald Tribune.*

21s net

Hodder and Stoughton

Best wishes to BEA on commencing full-scale services with the Vanguard airliner. Reglo single and double pole switches are fitted to Vickers' second generation turbo-prop aircraft as standard equipment.

C.W.C. EQUIPMENT LTD.
Kings Grove, Maidenhead
Berks, England
Tel.: Maidenhead 2275
Grams: DURAQUIP, MAIDENHEAD

established success

Plessey

UK-AN

Registered Trade Mark

connectors

* 2 kV r.m.s. all contacts
* −65°C to + 190°C working
* 30 p.s.i. pressure seal
* 180 contact arrangements
* Climatic proof
* Waterproof
* Shock proof
* Vibration proof
* Crimped connections
* Fireproof and hermetically sealed types
* Interchangeable with A.N. or M.S. connectors

This has prompted the publication of a fully descriptive booklet, No 109, which sets out in detail the characteristics of these outstanding connectors. Write for a copy now—on Company-headed paper, please.

Wiring and Connectors Division
THE PLESSEY COMPANY LIMITED
Cheney Manor · Swindon · Wilts · Swindon 6251

Overseas Sales Organisation:
Plessey International Limited · Ilford · Essex
Ilford 3040

CW21a

THE AEROPLANE and ASTRONAUTICS CLASSIFIED ADVERTISEMENTS

PRESS DAY: First Post, THURSDAY. **RATE: 1/- per word (minimum 12 words 12/-).**

EUROPE'S LEADING AIRCRAFT BROKERS

30 YEARS' SERVICE

LIGHT AIRCRAFT DIVISION

PIPER CARIBBEAN.

A brand new model available from stock. This is the Caribbean de luxe fitted with the Lycoming 150 h.p. engine. This beautiful four seat private touring aircraft is gaily painted in red and white. Immediate delivery. Ref. 3026.

CESSNA 180.

Another brand new model offered from stock. This is the Trainer version of the famous Cessna two seater and is fitted with full dual controls. Equipment includes VHF Narco Super Homer. Offered with public transport or private category C. of A. A great pleasure to fly for training or touring. Ref. 3209.

AUSTER TAYLORCRAFT PLUS D.

We have recently taken two of these aeroplanes into stock as part exchange and now re-offer them at the lowest possible prices. Both have current C.s of A. and are available for delivery in March. The Taylorcraft two seater is a really economical and reliable light aircraft ideal for any flying club, flying group or private owner requiring a closed cockpit aeroplane with a small capital purchase outlay.

MILES MESSENGER.

One of several that we can now offer, this Messenger has a Cirrus Major III engine with 494 hours since complete overhaul. VHF Murphy MR.66. Dual control. Offered with 12 months C. of A. Ref. 3140.

TRANSPORT AIRCRAFT DIVISION

DE HAVILLAND HERONS

HERON MK.2D.

This is an exceptional Executive de Luxe Heron which we are privileged to offer on behalf of His Majesty King Hussein of Jordan. New in November 1958 this aeroplane has flown under 1,000 hours and is offered for immediate delivery. Ref. 2788.

30 YEARS' EXPERIENCE

HERON MK.2D.

Another Heron built in 1958 and also owned by the Royal Jordanian Air Force. This aircraft is fitted with 15 passenger seats and has the long range fuel capacity of 418 imperial gallons. Airframe hours less than 1,000 since new. Ref. 2878.

EXECUTIVE AIRCRAFT DIVISION

offer

DORNIER S.T.O.L. AIRCRAFT

The Dornier DO.28 is the answer for the company needing the safety of a twin-engined aircraft, the comfort of a small airliner, the viability of a helicopter, and the ability to land and take off from a football pitch.

The passenger cabin seats four and can be modified to take a toilet and cocktail cabinet if required.

The single-engined version of this aeroplane is the DO.27 and already more than 500 have been built and are operating with military services and civil companies throughout the World.

The DO.27 and DO.28 are built to a specification designed for long utilization, models will not be changed each year to give a new line and the depreciation rate therefore will be very low. Demonstration aeroplanes will shortly be available in the United Kingdom but in the meantime full details of these S.T.O.L. aircraft can be obtained from Shackleton's.

NEW OR USED AIRCRAFT SUPPLIED .... CREDIT TERMS ARRANGED .... PART EXCHANGE WITH OTHER AIRCRAFT OR CARS

W. S. SHACKLETON (AVIATION) LTD

175 PICCADILLY · LONDON · W.1

TELEPHONE: HYDE PARK 2448/9 **CABLES: SHACKHUD, LONDON**

AIRCRAFT FOR SALE

R. K. DUNDAS, LTD.

WHILST we can at any one time offer our clients aircraft ranging from Piper Cubs to Constellations, there would appear to be an increasing demand for truly executive single- and twin-engined aircraft. We donate our space, therefore, this week to this class of aircraft.

PIPER AZTEC, 1960 Autoflite. Total time since new, 256 hours, green and white, a truly immaculate aircraft. The first used aircraft of its type to be offered in the U.K., £19,000.

PIPER APACHE, 1959 Autoflite. Total time since new, 350 hours, red and white, ADF-12E, Narco Mk. II and Mk V, really like new, £13,950.

BEECH M.35 BONANZA, 1960, total time since new, 270 hours, Narco Mk. V ADF-12E, 3-light marker, 5-place, full panel, auxiliary tanks, air conditioning, £11,490.

BEECH H.35 BONANZA, 1958, exceptionally clean, 760 t.t., dual Narco Mk. Vs, dual Narco VOR/ILS Loc., Narco 3-light Mkr., AFF-12E, T-3 Tactair Autopilot, Safelight speed control, auxiliary tanks, rotating beacon, £8,650.

R. K. DUNDAS, LTD., Dundas House, 59 Saint James's St., London, S.W.1. Phone, Hyde Park 3717. 575-22

GRANTAIR, LTD.

GRANTCHESTER, CAMBRIDGE.

Phone, Trumpington 3132 (24 hours per day).

YOU have a licence—we have aircraft. Recent C. of A. (private or hire and reward). H.P. or leasing. British and American, two, four or more seats, with or without radio, £1,000 to £10,000. Demonstrations anywhere, any time. Hire one for a week before you buy it. See also aircraft for hire and charter. zzz-768

EXECUTIVE twin CESSNA, complete with de-ice equipment, 360-channel V.H.F., A.D.F., V.O.R., and auto pilot. This beautiful airplane is only two years old, immaculate inside and out, 950 hours total time on airframe, 230 hours on engines since overhaul, original cost nearly £40,000. Only genuine inquiries please. This is an excellent opportunity to buy one of the most luxurious light twins today. Price £17,500 with C. of A. until 1962. Box A752, care of THE AEROPLANE AND ASTRONAUTICS. 575-12

JODEL MUSKETEER.

4-SEATER, 200 lb. baggage, or 5-seater with adequate luggage six hours' range at 140 m.p.h. Will operate with full load from fields of 250 yd. With luxurious furnishing, gyro compass and horizon at only £4,816; fly away Redhill Aerodrome. Try it yourself—contact

ROLLASON AIRCRAFT AND ENGINES, LTD.,

CROYDON AIRPORT.

Phone, Croydon 5151-52. 575-14

1959 Beechcraft Travel Air 95, blue-silver, engine hours nil since maor overhaul, regularly maintained, STR12D, Norca Omnigator, Sunair RTR, Lear 12E, demonstrations by arrangement at short notice. Box A662, care of THE AEROPLANE AND ASTRONAUTICS. 575-16

The 210

Cessna

SOLE DISTRIBUTORS IN GREAT BRITAIN ARE

AIRWORK SERVICES LTD

R.A.F. BOOKER NR. MARLOW BUCKS

CROSS PERFECT PRECISION AIRCRAFT SPRING WASHERS

TO B.S. SPECIFICATION 2 SP.47

CROSS MFG. CO. (1938) LTD

COMBE DOWN, BATH. Tel.: Combe Down 2355/8

PIAGGIO of GENOA

P.166, the Executive with airliner comfort: fully reclining armchairs, ample headroom, toilet, buffet, picture windows and the straight-in step

British Representatives

AERO-ENTERPRISES (Boreham Wood) Ltd

17 Drayton Rd, Boreham Wood, Herts: ELS 2688

Aircraft Wanted

SCRAP aircraft aluminium and stainless steel urgently required. Lowton Metals, Ltd., Lowton St. Mary's, near Warrington. Leigh 71441-2. zzz-0766

AIRCRAFT ACCESSORIES, SPARES AND COMPONENTS

ROLLASONS for Tiger Moth spares, Gipsy engine overhauls and spares, and now increased facilities at Biggin Hill for your C. of A. overhaul. All light aircraft types acceptable. zzz-775

THE REGIONAL AIR TRADING CO., Croydon Airport, for Rapide spares of every description. Phone, Croydon 8521. zzz-762

REPAIRCRAFT, LTD., The Common, Cranleigh, Surrey (Cranleigh 536), for instruments and auto-pilot overhaul. zzz-749

PHILLIPS AND WHITE, LTD.

THE leading stockists in the U.K. for instruments, navigational equipment, electrical components and parts, and engine accessories. Spares for de Havilland Gipsy, Major and Queen series and Armstrong Siddeley Cheetah IX, X and XV engines.

61 QUEEN'S GARDENS, London, W.2. Phone, Ambassador 8651, 2764. Cables, "Gyrair, London." zzz-772

PARACHUTES, 24-ft. nylon back-type, £10 each, ditto seat-type, £8 each, further details from H. H. Bradford, Ltd., Ramsey, Harwich, Essex. 578-528

PLUGS and sockets. More than 1,000,000 in stock, covering over 50 different ranges. British and American. Stock list on application to: Sasco, Nutfield, Redhill, Surrey. Phone, Redhill 5050. zzz-784

AIRFRAME spares for Dakotas, Harvards, Piper Cub, Fairchilds, Argus, Beechcraft, D-17s, Mosquito, Spitfire, Firefly. Engine spares for Pratt & Whitney, Armstrong Siddeley, Lycoming, etc., accessories and instruments for all types of aircraft.

C.47 Dakota operators please note, we offer a limited number of genuine brand-new Bendix 52058 tail wheels at a reasonable price.

A. J. WALTER, LTD., The Drive, Horley, Surrey. Phone, Horley 1420 and 4294. Cables, "Cubene Horley." 575-18

AIRCRAFT SERVICING

OVERSEAS AIR TRANSPORT, LTD., Manchester Airport, for overhauls, conversions and modifications at guaranteed prices. Phone, Mercury 5262, ext. 148. zzz-779

HANTS AND SUSSEX AVIATION, LTD., Portsmouth, have now obtained additional hangar space and can offer facilities for C. of A. overhauls, modifications and all types of repairs. Phone, Portsmouth 62087. 575-6

HELICOPTERS

FOR specialized helicopter operations in Engineering and Survey, Agricultural Spraying, Passenger Transport, Flying Training—contact Helicopter Services, Ltd., Luton Airport. Phone, Luton 4911. zzz-783

AVIATION COMPUTERS

KAYS, of Ealing, stockists of Aristo, Jeppesen, Weems, Swissair, R.A.F. Mk. 4, Box Dalton, computers; scale rules, protractors, etc., quotations, mail order, by return. Write for latest stock list, 8-10 Bond St., Ealing, W.5. Eal 2813. 575-787

PETER S. CLIFFORD & CO., LTD.

have pleasure in announcing their appointment as

SOLE U.K. AGENTS for Czechoslovakian light Aircraft.

In association with Group Captain Edward Mole, U.K. Distributor for Omnipol.

IMMEDIATE OFFER

BOTH MODELS have retractable undercarriage, V.P. propeller and fuel-injection engine.

META-SOKOL

S/engine 4 seater

AERO 145

light twin 4 seater

Full spares backing from approved stores at Kidlington.

Demonstration aircraft available in the near future.

Enquiries Welcomed

Peter S. Clifford & Co., Ltd.

OXFORD AIRPORT, Kidlington, Oxford
Phone: Kidlington 3355
Weekends and evenings Bletchington 392

GENERATOR TEST STAND (Varidrive)
by U.S. Varidrive Corpn. of America
Very little used—15 h.p. motor
Cost approx. £1,800 - Our Price £675
ALSO
ONE only—20 h.p. Machine
A.M. Pattern
by Messrs. Norman Lyon Ltd.
Cost approx. £2,500 - Our Price £975
Both Ex Stock ! ! ! No Waiting ! ! !
STARAVIA LTD
Redfields Works, Church Crookham
Nr. Aldershot Hants

MARSHALL
AIRPORT WORKS CAMBRIDGE

ELECTRICAL INSPECTORS

FIRST CLASS MEN REQUIRED FOR WORK ON MODERN SERVICE AND CIVIL AIRCRAFT

GOOD AVERAGE EARNINGS
SUBSISTENCE PAYABLE
SINGLE LODGING ACCOMMODATION AVAILABLE
ASSISTANCE WITH HOUSING

Write, Call or Phone for Interview
Cambridge 56291 Extn. 36
EMPLOYMENT OFFICER

CLOTHING

R.A.F. Officers' uniforms for sale, new and reconditioned. Fisher's, 86-88 Wellington St., Woolwich. Phone 1055. Kits also purchased. zzz-774

CONSULTANTS

R. H. STOCKEN, F.R.Ae.S., Eagle House, 109 Jermyn St., S.W.1. Whitehall 2777-8. zzz-743

IAN S. McNICOL London School of Air Navigation. Pilot and navigator training with advisory service. 33 Ovington Square, Knightsbridge, S.W.3. zzz-746

R. W. SUTTON (CONSULTANTS), LTD., 7 Lansdowne Place, Cheltenham. Phone 5811. 575-9121

ELECTRICAL EQUIPMENT

ELECTRICAL connectors. More than 1,000,000 in stock, covering over 50 different ranges. British and American. Stock list on application to Sasco, Nutfield, Redhill, Surrey. Phone, Redhill 5050. zzz-785

GLIDING TUITION

GLIDING holidays for beginners and B pilots, May-September. Details from Course Secretary, Yorkshire Gliding Club, 29 Middlethorpe Grove, Dringhouses, York. 575-2

HIRE AND CHARTER

GRANTAIR, LTD.,
GRANCHESTER, CAMBRIDGE.
Phone, Trumpington 3132 (24 hours per day).

You have a licence—we have aircraft with or without pilot, with or without radio, two or four seats, Tri-Pacers, Caribbeans, Cubs or Austers, for hire or lease. (Free maintenance, insurance and repairs.) From £3 10s. per engine hour without pilot or 1s. 3d. per mile with pilot.

Europe—Africa or Asia covered. See also Aircraft for Sale. zzz-769

INSURANCE

ENDOWMENT assurance, house purchase and retirement provision, including full flying cover without extra premiums for pilots and aircrew of B.E.A., B.K.S., B.O.A.C., British United Airways, Cunard-Eagle, Silver City and members of B.A.L.P.A. City Assurance Consultants, Ltd., 28 Monument St., London, E.C.3. Mincing Lane 3844. 576-x1821

MACHINERY, TOOLS AND PLANT

SPRAY gear virtually unused, perfect condition, four 70-gallon tanks complete, four spray pumps completely overhauled, above with full ancillary equipment, contact J. M. Tussaud, 119 Piccadilly, London. 575-x1795

PACKING AND SHIPPING

R. AND J. PARK, LTD., 143-9 Fenchurch St., E.C.3. Phone, Mansion House 3083. Official packers and shippers to the aircraft industry. zzz-782

PHOTOGRAPHY

AEROPLANE photographs, 5,000 available, including 1914-19 warplanes, latest U.S.A. and British jets, 5½ in by 3½ in., 8s. per dozen. Lists and specimens, 2s. 6d. post free. Also thousands of ships and railways. Real Photographs, Ltd., Victoria House, Southport. 575-7

RADIO AND RADAR

SPERRY ZERO reader, Type ZL1 course selectors, control panels, flight computers and indicators, three complete installations in stock. A. J. Whittemore (Aeradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-780

STR12D, STR9Z, STR9X and most other British and American V.H.F. R/T equipment always in stock. A.R.B.-approved design installations into any type of aircraft. A. J. Whittemore (Aeradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-781

SITUATIONS VACANT

EXPERIENCED aircraft radio/electrical mechanic required by Trans-Canada Airlines. Apply: Regional Maintenance Superintendent, London Airport, Hounslow, Middlesex. 575-518

PILOTS. Viscount Captains and First Officers required. Maitland Drewry Aviation, Gatwick Airport. 575-523

DANISH AIR CHARTER require the following personnel for Viscount 700 series operating out of Copenhagen: Two captains and two first officers; one A and C licensed engineer. Generous salary scales plus living allowances will be paid. Apply in first instance in writing with full particulars to Blanford and Houdret, Ltd., 101 Leadenhall St., London, E.C.3. 575-525

DAN-AIR ENGINEERING, LTD., invites application for employment at Lasham Airfield from experienced engine - airframe fitters, instrument mechanics and aircraft electricians. Please apply Chief Engineer, Lasham Airfield, near Alton, Herts. 576-527

AUTAIR, LTD., urgently require experienced captains, first officers and air hostesses for their U.K. based DC-3 operations. Please write giving full details to Chief Pilot, Autair, Ltd., 75 Wigmore St., London, W.1. 575-533

REQUIRED immediately:—

LICENSED Engineers Category A and/or C on Argonaut C4, Viking, Ambassador, Dove or Heron aircraft.

CATEGORY X on Instrument and/or Electrical.

EXPERIENCE on inspection in an approved organization an advantage.

VACANCIES also exist for senior technical records clerks.

APPLY to: Chief Inspector, Overseas Aviation Engineering, Ltd., Overseas Hangar, Gatwick Airport. 575-535

DOVE A- and C-licensed engineer required for initial 12-month contract overseas; generous pay and allowances with free living quarters. Write to Box A742, care of THE AEROPLANE AND ASTRONAUTICS. 575-534

LICENSED ENGINEER required as Assistant to Superintendent must have A including pressurized aircraft and C licence. This position which is a permanent one is in the Nottingham Area. A contributory pension scheme is in operation. Apply giving full details to Box A751, care of THE AEROPLANE AND ASTRONAUTICS. 575-13

For the longest pier in the world you come to Southend.

For the largest stocks of DC.4, Viking, Pratt & Whitney and Bristol Aero Engine Spares you come to Southend.

Having acquired a major airline's stock of DC.4 Spares we now have the most comprehensive stock in Europe.

All our stock is brand new and released.

Prices quoted on request

Airline Air Spares LTD.

Associated with

T. D. Keegan Ltd.

SOUTHEND AIRPORT
SOUTHEND-ON-SEA, ESSEX

Telephone: ROCHFORD 56881-2-3
Telex 1943

For A.O.G. service after office hours contact:
MR. EDWARDS—SOUTHEND 47828
MR. NOBLE—SOUTHEND 43863

Now FAA CERTIFICATED

NELSON LIGHT Aircraft Engines

Model H-63CP for propeller-driven craft weighs only 67 lbs. complete with starter, generator, dual ignition, carburetor, air filter. Delivers 48 hp at 4,400 rpm. Certificated 42" wood prop available.

Model H-63C for rotary-wing craft weighs 76 lbs. with centrifugal clutch, shrouds, all electrical equipment, delivers 43 hp at 4,000 rpm. Runs in any position.

Write for particulars.

NELSON SPECIALTY CORPORATION
440 PERALTA AVE. • SAN LEANDRO, CALIFORNIA

FLIGHT ENGINEERS

BRITISH OVERSEAS AIRWAYS CORPORATION

invite applications for employment

as

ENGINEER OFFICERS (FLIGHT ENGINEERS)

Applications are invited to fill a limited number of vacancies for Engineer Officers in the immediate future and later in 1961. Candidates should be between 21 and 36 years of age, and their medical standard should not be less than that required for the Flight Engineer's Licence. Qualifications required are a high standard of education, at least two years' experience in aircraft maintenance, including both engines and airframes, in addition to academic engineering training, or an apprenticeship in aeronautical engineering or its equivalent with adequate practical experience in maintenance of modern heavy aircraft or two years' experience as a Pilot or Flight Engineer with a good practical maintenance engineering experience in addition.

Desirable additional qualifications are the possession of a Maintenance Engineer's Licence endorsed in categories "A" and/or "C" applicable to heavy aircraft. In any case, applicants will be expected to reach this technical standard after training. Applicants will be required to undergo aptitude tests and to sit an examination designed to test basic mathematical and engineering knowledge. Those reaching the required standard will be called to attend a Selection Board. Successful applicants will be appointed for a probationary period, including training to enable them to obtain the Flight Engineer's Licence. During this time they will receive a salary within the bracket of £875/£940 per annum. On appointment as an Engineer Officer a starting salary of £1,150 per annum is payable, rising to £2,275 per annum, maximum.

Write for Application Form to Recruitment and Postings Superintendent (Flying Staff), B.O.A.C., London Airport, Hounslow, Middlesex

Southend Municipal Flying School

Commercial and Private Pilot's Licence. Instructors Rating. Night Flying every night. No entrance fee or subscription.

Austers £4 5s. solo; £4 15s. dual; contract rate £4. Chipmunks £5 10s. dual or solo.

Municipal Airport, Southend-on-Sea, Essex
Phone: Rochford 56204

THE BRITISH AIRLINE PILOTS ASSOCIATION
81, New Road, Harlington, Middx. *Tel. HAYes 3442/3*

Membership open to all Commercial and Service Pilots. For full details as to Objects and particulars of Membership, please write to General Secretary.

MARSHALL
AIRPORT WORKS CAMBRIDGE

Require

AIRFRAME FITTERS
AIRCRAFT ELECTRICIANS

for interesting work on modern aircraft

HIGH AVERAGE EARNINGS RESULTING FROM GOOD WAGE RATES, PRODUCTION BONUS AND OVERTIME

Subsistence payable

Single lodgings available near works

Write, Call or Phone
CAMBRIDGE 56291 EXT. 36

EMPLOYMENT OFFICER

Situations Vacant—contd.

AIR MINISTRY have vacancies for civilian Radio Technicians at Royal Air Force, Sealand, Cheshire, R.A.F. Manston, Kent, R.A.F. Aldergrove, N. Ireland, and a few other R.A.F. Stations throughout the United Kingdom for the servicing, repair, modification and testing of air and ground radio and radar equipment. Commencing salary (National) (according to age) is £525-£670 p.a. Max. salary £798 p.a. Rates are subject to small deduction at certain provincial stations. Annual leave 3 weeks and 3 days increasing to 4 weeks 2 days after 10 years' service, 5 weeks after 20 years' service and 6 weeks after 30 years' service. A limited number of houses may be available for renting at Sealand. These houses are at West Kirby some 15 miles distant. Apply, giving details of qualifications and experience, and mentioning this advertisement, direct to Commanding Officer, No. 30 Maintenance Unit, Royal Air Force, Sealand, Cheshire (for Sealand vacancies), Commanding Officer, R.A.F. Manston, Kent (for Manston vacancies), Commanding Officer, R.A.F. Aldergrove, near Crumlin, N. Ireland (for Aldergrove vacancies) or to Air Ministry, C.E.3g, Princes House, Kingsway, London, W.C.2, for vacancies in other areas or apply any Employment Exchange quoting City O/N 3057. 575-8

DAN-AIR ENGINEERING, LTD.,
REQUIRE
ENGINE CHARGEHAND

FOR R.R. MERLIN, BRISTOL HERCULES AND CENTAURUS, P. AND W. 1830 AND GIPSY QUEEN 70 ENGINE MAINTENANCE.

Monthly staff position, three weeks paid leave, expenses, generous sick pay scheme.

APPLY:—CHIEF ENGINEER,
LASHAM AIRFIELD,
NEAR ALTON,
HANTS. 576-536

APPLICATIONS are invited from Dakota and/or Dove captains for positions in the Middle East. VACANCIES also exist for licensed or unlicensed engineers with Dakota and Dove experience, to the standard of foreman or leading hand, and for licensed engineers with qualifications in Categories A and C, for light aircraft, if possible including the Cessna 180. Please reply to Box A753, care of THE AEROPLANE AND ASTRONAUTICS. 576-537

THE Air Registration Board invites applications for the post of Powerplant Surveyor in connection with the approval of propellers and helicopter transmission. Applicants should have general experience with propeller design and manufacture and hold the equivalent at least of Higher National Certificate. Age between 25 and 30 years.

THE post is permanent and successful applicant would be required to join the Board's superannuation fund. Salary will depend upon qualifications and experience.

APPLICATIONS should be submitted with full details of education, technical training and experience to The Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2. 575-1

THE Air Registration Board invites applications for the post of Design Surveyor to assist in the approval of electrical instruments and controls. Applicants should have experience in instrument and electronic techniques as applied to aircraft systems (e.g., autopilots), and preferably be qualified electrical engineers, between 25 and 35 years of age.

THE post is permanent and successful applicant would be required to join the Board's superannuation fund. Salary will depend upon qualifications and experience.

APPLICATIONS should be submitted with full details of education, technical training and experience to The Secretary, Air Registration Board, Chancery House, Chancery Lane, London, W.C.2. 575-10

TYNE TEES AIR CHARTER, Newcastle-on-Tyne, requires commercial pilot with I/R for Dove or other twin aircraft. Apply, Mr. Mohamed, Newcastle-on-Tyne 20807, or Mr. Waites, 101 Leadenhall St., London, E.C.3. Avenue 1942. 575-x2017

NIGERIA AIRWAYS have vacancies for first officers for D.C.3s. Possible command flying on Piper Aztec aircraft if applicant has sufficient experience and holds senior licence. Salary in range £2,045 to £2,360, including inducement pay. Generous gratuity scheme, education allowances, free accommodation and medical facilities. Free passages for wife and up to two children. Apply to Chief of Flight Operations, Nigeria Airways, Lagos Airport, Nigeria, or Nigeria Airways, 32 New Bond St., London, W.1. 575-21

MINISTRY OF AVIATION: Air Traffic Control Officers. Posts for men or women at least 23 and under 35 on 1.7.61. Candidates must have had recent aircrew experience, preferably as pilot or navigator in civil air transport or H.M. Forces; but exceptionally, extensive experience in A.T.C.O. duties may be accepted. They should normally also have G.C.E. with five passes, or an equivalent academic qualification. Starting salary (London) from £825 to £1,190. Maximum £1,522. Appointments initially unestablished, but prospects of establishment and promotion. Write Civil Service Commission, Burlington Gardens, London, W.1, for application form, quoting 5227/61. 575-17

COMMERCIAL pilots required for agricultural flying overseas; preference is given to those with experience of this type of work and with light aircraft background and endorsements on Piper and Auster; good basic salary plus bonus offered. Apply in writing to Crop Culture (Aerial), Ltd., Bembridge Airport, Isle of Wight. 575-19

EAST AFRICAN AIRWAYS CORPORATION (NAIROBI) have a vacancy for an assistant operations planning officer. Duties include production of service schedules, route analysis, calculations fuel estimates, flying hours, production of flight plans, route information, WAT/RTWO tables, liaison with engineering/sales/traffic/accounts, etc. Applicants must have proven experience in operations planning department of an airline. Salary scale—£1,250-£1,520 p.a., according to qualifications, plus housing assistance, transport allowance, medical/pension scheme, U.K./local leave, free passages, etc. Apply P.M., B.O.A.C. Associated Companies, Ltd., Airways Terminal, Buckingham Palace Rd., London, S.W.1. 575-20

TRADAIR, LTD., require skilled aircraft electricians, preferably with Viscount experience. Please write giving full details of experience, to Chief Engineer, Tradair, Ltd., Southend Airport, Essex. 577-538

MARSHALL
AIRPORT WORKS CAMBRIDGE

RADIO ENGINEER
WITH 'A' LICENCE
REQUIRED FOR AIRCRAFT RADIO MAINTENANCE

GOOD COMMENCING SALARY
SUPERANNUATION
IMMEDIATE HOUSE AVAILABLE FOR SUCCESSFUL APPLICANT

Written applications should be addressed to
PERSONNEL MANAGER

BRITISH
WIRE THREAD INSERTS

Precision made in Carbon Steel for Aluminium and Magnesium. Also in Stainless Steel and Bronze.

B.S.F. • Metric • B.S.P. • B.A.
Whitworth • Unified

CROSS MANUFACTURING CO. (1938) LTD
COMBE DOWN · BATH · SOMERSET

MARSHALL
AIRPORT WORKS CAMBRIDGE

RADIO SUPERINTENDENT

with 'A' and 'B' licence (radar licence desirable but not essential) to take charge and develop aircraft radio section. Good commencing salary, superannuation, immediate house available for successful applicant.

Written applications should be addressed to

PERSONNEL MANAGER

Situations Vacant—contd.

ENGINEERS holding A and C or A licence on Dakota, Bristol 170 and Viking aircraft required. Apply Channel Airways, Southend Airport. Phone, Rochford 56460. 575-15

THE SCIENTIFIC CIVIL SERVICE

NEEDS MEN AND WOMEN FOR PENSIONABLE POSTS AS

(A) SENIOR SCIENTIFIC OFFICERS

AND

(B) SCIENTIFIC OFFICERS

IN ALL MAJOR SCIENTIFIC FIELDS, INCLUDING

PHYSICS
ENGINEERING
CHEMISTRY
METEOROLOGY
MATHEMATICS and
BIOLOGICAL SUBJECTS

Age limits: (a) at least 26 or under 32, (b) at least 21 and under 29. Extension for regular Forces service and Overseas Civil Service. Qualifications: normally a degree, or a Diploma in Technology, with first- or second-class honours in science, mathematics or engineering, or equivalent attainment; additionally for (a) at least three years' relevant post-graduate experience. Selection by interview. London salaries (subject to review): (a) £1,382-£1,704; (b) £759-£1,258. Provision for starting salary above minimum. Promotion prospects.

WRITE CIVIL SERVICE COMMISSION,
17 NORTH AUDLEY STREET,
LONDON, W.1,

FOR APPLICATION FORM, QUOTING (a) S/53/61, (b) S/52/61. 575-5

TWO lecturers or assistant lecturers (a) one with experience and interest in experimental techniques and, if possible, electronics (b) one with bias towards theoretical work, particularly in conjunction with digital computers required in Sub-Department of Aeronautical Structures. Salary scales: Lecturer £1,050 x 50 to £1,400 x 75 to £1,550 (bar) x 75 to £1,850; assistant lecturer £800 x 50 to £950, both plus £60 London allowance and family allowances. Apply Professor of Aeronautical Structures, Imperial College of Science and Technology, London, S.W.7. 575-11

SITUATIONS WANTED

CORPORATION pilot seeks responsible position, U.K. or Europe. Over 4,000 hours Twin Bonanza, Twin Beechcraft, Aero Commander. Commercial, multi-engine, instrument, instructor, ATR writtens, top U.S. experience, references. Can ferry your aircraft from U.S. Box A754, care of THE AEROPLANE AND ASTRONAUTICS. 575-23

TENDERS

CITY AND COUNTY OF
NEWCASTLE UPON TYNE.

SALE OF AIRCRAFT.

TENDERS ARE INVITED FOR THE FOLLOWING AIRCRAFT WHICH THE NEWCASTLE UPON TYNE CORPORATION HAVE FOR DISPOSAL:—

ONE AUSTER J1N WITH LONG-RANGE TANK.
ONE AUSTER J1N WITH GLIDER-TOWING EQUIPMENT.
ONE AUSTER AUTOCRAT WITH CIRRUS MINOR 2 ENGINE.
ONE AUSTER AIGLET TRAINER WITH PLESSEY 5-CHANNEL RADIO.
ONE MILES GEMINI WITH CIRRUS MINOR 2 ENGINES AND STANDARD S.T.R.9 RADIO.

Tenders should be forwarded to the undersigned not later than Wednesday, March 22, 1961, in the official envelope which may be obtained from the Airport Commandant, Municipal Airport, Woolsington, Newcastle upon Tyne, from whom full particulars about the aircraft may also be obtained.

Town Hall, Newcastle upon Tyne. 10/2/61. JOHN ATKINSON, Town Clerk. 575-3

TUITION

LONDON SCHOOL OF AIR NAVIGATION offers full-time personal coaching with home-study correspondence courses or combination of both for all aspects of professional pilot and navigator qualifications; also P.P.L. Officially appointed Services Courses Scheme, 33 Ovington Square, Knightsbridge, London, S.W.3. Ken 8221. zzz-755

AVIGATION, LTD., provides full-time or postal tuition or a combination of these methods for M.C.A. Pilot/Navigator licences. Classroom instruction can be provided for A.R.B. General, certain specific types and performance schedule examinations, D4 Links. Phone, Rodney 8671. For details apply Avigation, Ltd., 30 Central Chambers, Ealing Broadway, London, W.5. Ealing 8949. zzz-771

DENHAM LINK TRAINING CENTRE. £1 seven-day week. Denham 2161 and 3171. zzz-741

EXETER AIR CENTRE offers the least expensive and most comprehensive flying training available today, contract rates from £3 7s. 6d. per hour. Normal Auster/Tiger rate £3 12s. 6d., Chipmunk £5 5s. P.P.L. courses from £108 15s., C.P.L. from £665. Instructor's course from £72 10s. Special attention to individual requirements. Full Air Traffic Control. Radio aids. VHF/DF and 24-hour Met. service, grass or runways. Local accommodation from £3 10s., Airport £5 15s. 6d. Exeter Airport, Ltd., Exeter 67433. zzz-778

THE COLLEGE OF AERONAUTICS,

A SHORT COURSE COVERING

RECENT ADVANCES

IN

FLIGHT TESTING METHODS

will be held at the College from

MONDAY, MARCH 13, TO FRIDAY, MARCH 24, 1961.

THE Course deals with modern dynamic stability and performance testing methods, the associated instrumentation requirements and calibration, and the means available for handling flight test data.
STUDENTS will fly in the College Dove and M.S.760 Paris aircraft.
THE fee for the Course is £75, inclusive of full board and residence.
FURTHER details and forms of enrolment may be obtained on application to the Warden, The College of Aeronautics, Cranfield, Bletchley, Bucks. 575-1111

LOUGHBOROUGH COLLEGE OF
TECHNOLOGY,
LEICESTERSHIRE.

FOR a sound technological education allied with practical training, apply to the Academic Registrar for a College Prospectus and enrolment form.
COURSES are available in aeronautical, automobile, chemical, civil, electrical, mechanical, production engineering and industrial chemistry.
ALL courses lead to the award of the College Diploma and to the National Diploma in Technology (except civil and automobile engineering).
FULL residential accommodation is available in halls of residence and the student village. Tutorial advice and guidance given to all students. 575-4

MINISTRY-APPROVED Trainers. For instrument rating practice come to us, the recognized specialists for 12 years. Link Training Services, Ltd., 33 Ovington Square, London, S.W.3. Knightsbridge 2089. 581-507

..FOR A DRIP-PAST A

GENUINE *Jubilee*
REGD. TRADE MARK
WORM DRIVE HOSE
CLIP
The Finest Clip in the World

Jubilee
'CLIPDRIVER'
COMPANION ACCESSORY TO THE WORLD'S FINEST CLIP

L. ROBINSON & CO. (Gillingham) LTD.
LONDON CHAMBERS, GILLINGHAM, KENT TEL: 51182/3

AERODYNAMICIST

A leading engineering manufacturer requires an aerodynamicist to act as a liaison engineer between design and development staffs, and to initiate research and development programmes.

Essential qualifications are a research or honours degree in mechanical engineering, followed by industrial or government experimental work on flow problems.

The vacancy would suit a man 30-40 years of age who, to succeed, must be prepared to broaden his activities outside conventional aerodynamics. Salary not less than £2,000 per annum.

All replies will be treated in strictest confidence.

Write Box No: A 1004 LPE 60/62 St. Martin's Lane, London, W.C.2.

Tuition—contd.

LEARN to fly. £32; instructors' licence and instrument flying for £4 per hour; night flying £5 per hour. Residence 6 gns. weekly. Specialized course for commercial pilot's licence. Wiltshire School of Flying, Ltd., Thruxton Aerodrome (Andover Junction 1 hour 15 minutes from Waterloo). Hants. zzz-788

SURREY AND KENT FLYING CLUB, Biggin Hill (BN9) 2255. M.o.A.-approved course. Tiger and Hornet Moths. Chipmunk and Prentice. Contract rates. Route 705, one hour from Victoria. 575-761

BOOKS AND PUBLICATIONS

"CAMERA IN THE SKY," by Charles Sims, with a preface by Air Chief Marshal Sir James Robb. For more than 30 years Charles Sims, chief photographer of THE AEROPLANE AND ASTRONAUTICS and one of Britain's best-known aerial photographers, has watched the amazing growth of British aviation from a ring-side seat. In this book he recalls with pen and camera, enlivened with anecdote, some of his many memories of those eventful days. Illustrated. 218 pages. 25s. net from booksellers, or 26s. 6d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. zzz

"THE AEROPLANE" PICTORIAL REVIEW (No. 4). Compiled by the staff of THE AEROPLANE AND ASTRONAUTICS. In this fourth annual miscellany of the most interesting photographs to have appeared in the pages of THE AEROPLANE AND ASTRONAUTICS, there are over 230 photographs grouped for ease and reference in 12 sections. New features are a Farnborough Display section and an index providing a ready reference to all makes of aircraft and missiles. Illustrated. 128 pages. 12s. 6d. net from booksellers, or by post, 13s. 7d. from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. zzz

Ward, Brooke & Co. Ltd.,
High Wycombe, Bucks.
Telephone: High Wycombe 4531

●

Details of the following gladly sent on request

HIGH TEMPERATURE TERMINAL BLOCKS
FLEXIBLE NYLON DUCTING
ADJUSTABLE PIPE CLAMPS AND STRAPPINGS
RADAR VISORS
CABLE MARKERS
IDENT TABS
ETC. ETC.

●

Sole manufacturers and licensees
"VICKERSTRIP"
TERMINAL BLOCKS
as supplied for
THE VANGUARD

Precision Sheet Metal Workers and Light Engineers to the Aircraft Industry

Manufacturers of fabricated parts and assemblies in ferrous and non-ferrous metals. Tools, jigs and machined parts for the assemblies can be produced in our own workshops.

Let us quote for your requirements.

M.O.A. Approved D.G.I. No. 50037 — *Fully Approved A.R.B. Ref. No. A1/2502/47*

C. W. FLETCHER & SONS LTD.
STERLING WORKS, ARUNDEL STREET, SHEFFIELD, 1
ALSO MORTIMER WORKS, MATILDA LANE, SHEFFIELD, 1
Telephone: Sheffield 28049 & 28040 — ESTABLISHED 1891 — Telegrams: Assayed Sheffield 1

INTERPLANETARY FLIGHT
by A. C. CLARKE, B.Sc., F.R.A.S.

"Remarkably comprehensive, exciting and persuasive"
—THE TIMES WEEKLY

8¾ × 5¼ ins. *Illustrated*

Obtainable from Booksellers, **12s. 6d. net**
or by post **13s. 2d.** *from the Publishers*

TEMPLE PRESS LIMITED
Bowling Green Lane, London, E.C.1

D.G.I. Ministry of Aviation Approved. A.R.B. etc.
R.L.A. GUARANTEED LAMINATED ALUMINIUM
Spec.: D.T.D. 900/4526
Great Time Saver . . . Accuracy Assured . . . Sheets or Components.
B. ATTEWELL & SONS LIMITED
Sole Distributors
Makers of Aircraft Components for over 20 years.
Phones Iver 1102-3-4 IVER, BUCKINGHAMSHIRE. Grams "Reflection-Iver"

INDEX TO ADVERTISERS

Name	Page
A	
Aero-Enterprises (Boreham Wood), Ltd.	16
Airline Air Spares, Ltd.	17
Airwork Services, Ltd.	16
Associated Electrical Industries	3
Attewell, B., & Sons, Ltd.	20
B	
Box No. A1004	19
British Airline Pilots Association	18
British European Airways	1
British Overseas Airways Corporation	18
C	
Clifford, Peter S., & Co. Ltd.	17
Cross Manufacturing Co. (1938), Ltd.	16, 18
C.W.C. Equipment, Ltd.	14
D	
Darchem Engineering, Ltd.: British Refrasil Div.	14
Decca Radar, Ltd.	2
Delaney Gallay, Ltd.	9
Dowty Electrics, Ltd.	Inside Back Cover
E	
Elliott Brothers (London), Ltd.	4
F	
Fletcher, C. W., & Sons, Ltd.	20
Flexello Castors & Wheels, Ltd.	6
G	
Glacier Metal Co., Ltd., The	6
Godfrey, Sir George & Ptnrs., Ltd.	7
H	
Handley Page, Ltd.	8
Hawker Siddeley Aviation, Ltd.	Front Cover
Hodder & Stoughton, Ltd.	14
K	
Kidde, Walter, Co., Ltd., The	5
L	
Lucas Gas Turbine Equipment, Ltd.	Back Cover
M	
Marshalls Flying School, Ltd.	17, 18
N	
Nelson Specialty Corporation	17
Normalair Ltd.	12
P	
Plannair, Ltd.	4
Plessey Co., Ltd., The	15
R	
Robinson, L., & Co. (Gillingham), Ltd.	19
Rolls-Royce, Ltd.	11
Rotax, Ltd.	Inside Front Cover
S	
Shackleton, W. S. (Aviation), Ltd.	16
Short Brothers & Harland, Ltd.	13
Southend Municipal Flying School	18
Staravia, Ltd.	17
Step Industrial Equipment, Ltd.	6
T	
Trans-Canada Airlines	10
W	
Ward, Brooke & Co., Ltd.	20

Printed in England and Published Weekly by the Proprietors, TEMPLE PRESS LIMITED, BOWLING GREEN LANE, LONDON, E.C.1.
Registered at the G.P.O. as a Newspaper. Second class postage paid at New York, N.Y. Registered for transmission to Canada and Newfoundland by magazine post. Annual Subscription Rate United Kingdom 95/-, other countries 100/- (Canada and U.S.A. $15) postage included. Shorter periods pro rata. AGENTS ABROAD—EUROPE—Messageries Dawson (S.A.), Paris; Messageries, Hachette et Cie., Paris; W. H. Smith & Son, Paris and Brussels. CANADA—Wm. Dawson Subscription Service, Ltd., Toronto; Gordon & Gotch, Ltd., Toronto. U.S.A.—Eastern News Co., 306 West 11th Street, New York, 14, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; Wm. Dawson & Sons (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 100, Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.

DOWTY
LIMIT SWITCHES
for aircraft

units from this range are used on these aircraft

MICROSEAL

Sealed limit switch with button operation. Wide ambient temperature range.

HERMIC

Hermetically sealed limit switch for high altitude operation. Wide ambient temperature range.

DOWMIC

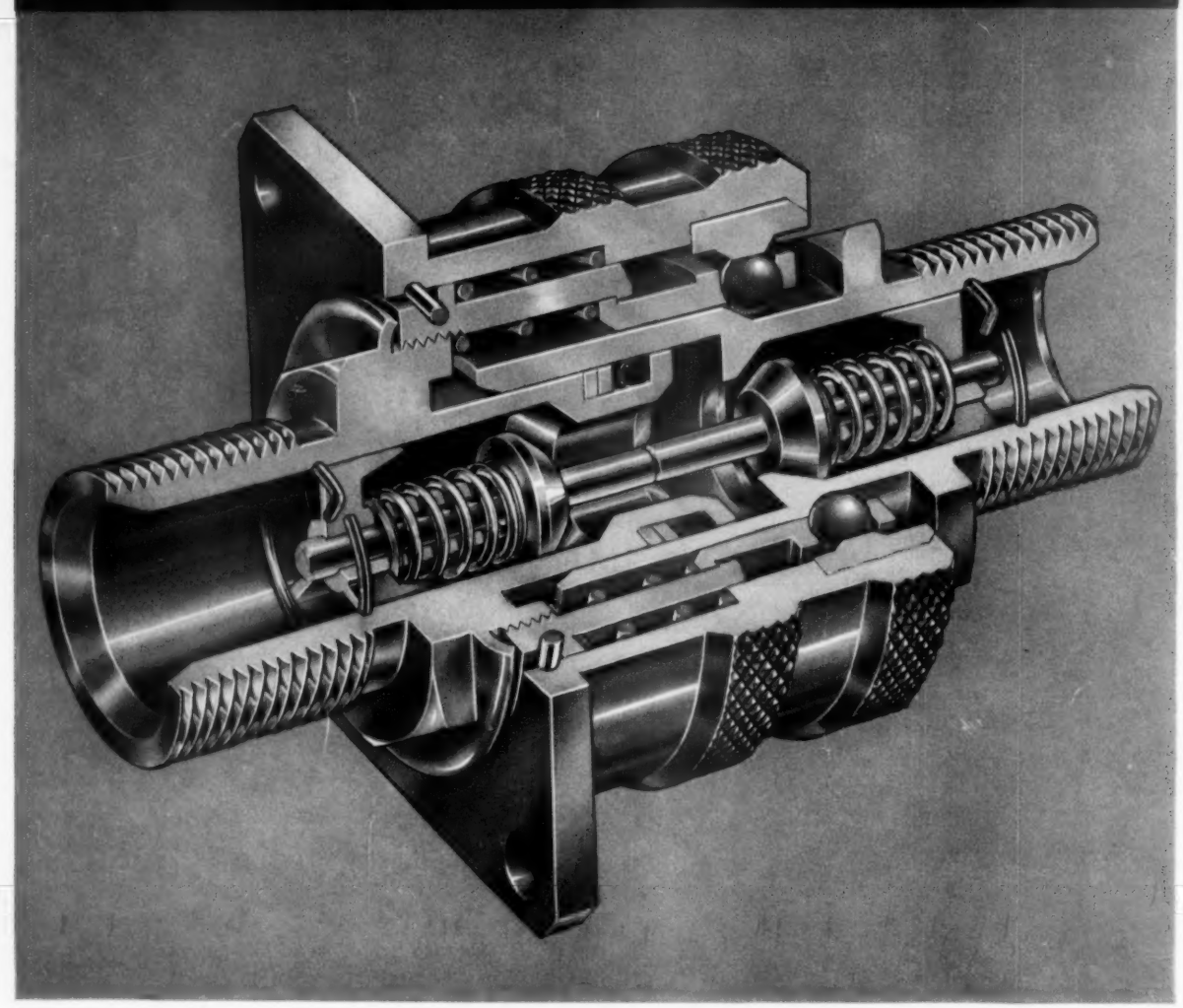
Double pole changeover switch with heavy duty contacts. Low button operating pressure.

Argosy	Jet Provost
Beverley	Lightning
Britannia	Scimitar
Buccaneer	Sea Hawk
Comet	Sea Venom
Gannet	Sea Vixen
Gnat	Shackleton
Herald	Viscount
Hunter	Victor
Javelin	Vulcan

DOWTY ELECTRICS LIMITED **TEWKESBURY GLOS.**

Member of the Dowty Group *Telephone: Tewkesbury 2383.*

FROM LUCAS CARE STEMS LUCAS ACHIEVEMENT



QUICK RELEASE COUPLING FOR HIGH PRESSURE SYSTEMS

• Working pressure up to 5000 p.s.i. • At full working pressure a quick and simple action disconnects the coupling. • Seals completely and automatically on disconnection. • Only one hand, without tools, required for coupling and uncoupling. • System remains primed. • The coupling cannot be blown apart. • Air is not introduced whilst recoupling, facilitating detachable servo signal connections. • Suitable for fluids or gases of a non-corrosive nature. • Overall length of unit illustrated 2·51".

Lucas Gas Turbine Equipment Ltd., Birmingham and Burnley.
Lucas-Rotax (Australia) Pty. Ltd., Melbourne and Sydney, Australia.
Lucas-Rotax Ltd., Toronto, Montreal and Vancouver, Canada.

LUCAS

FUEL AND COMBUSTION SYSTEMS FOR GAS TURBINE AND RAM JET ENGINES